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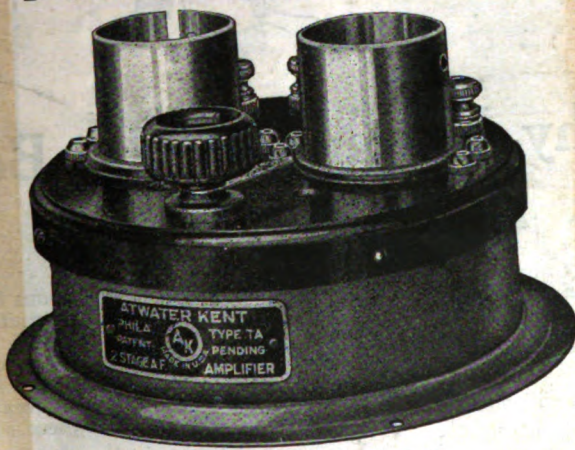
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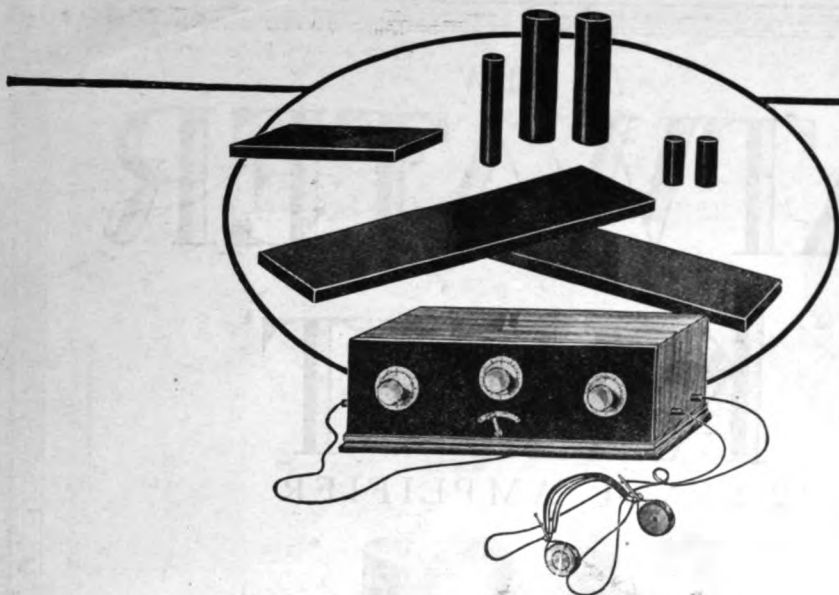
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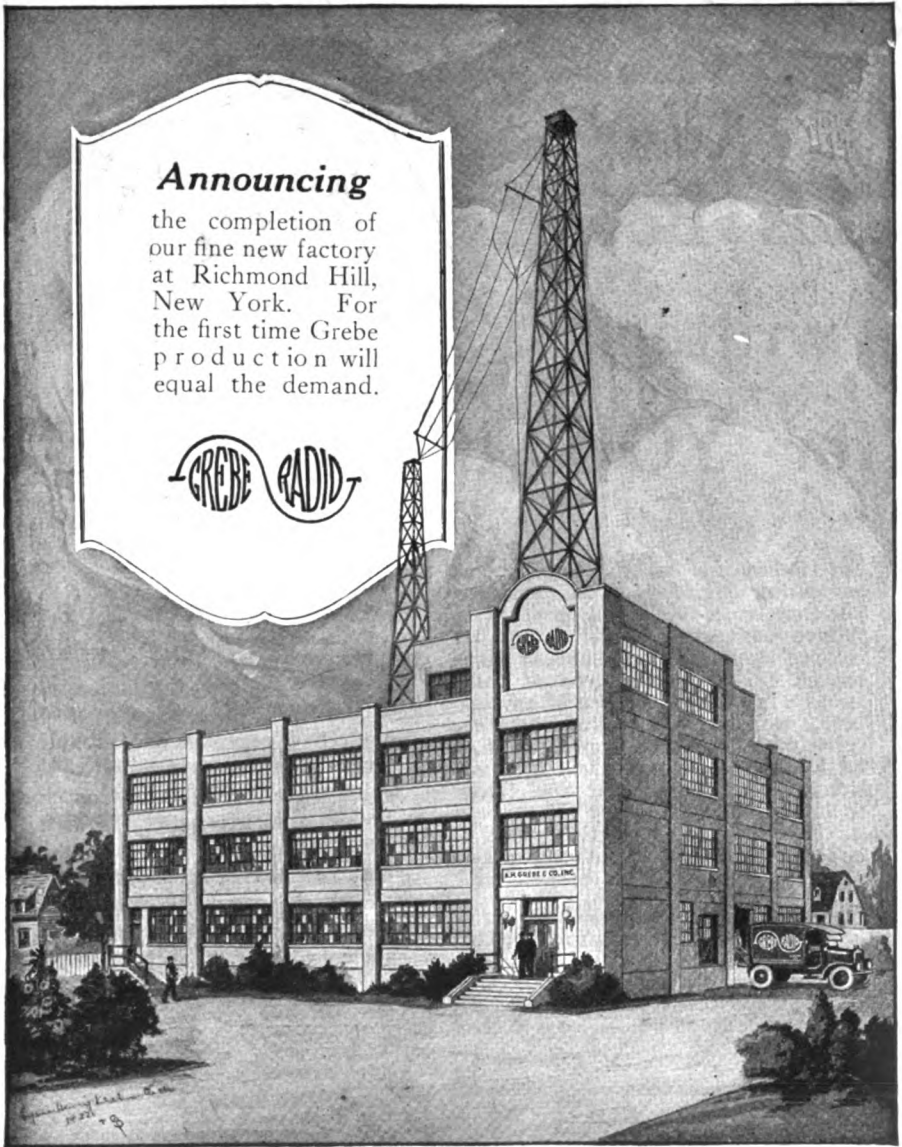
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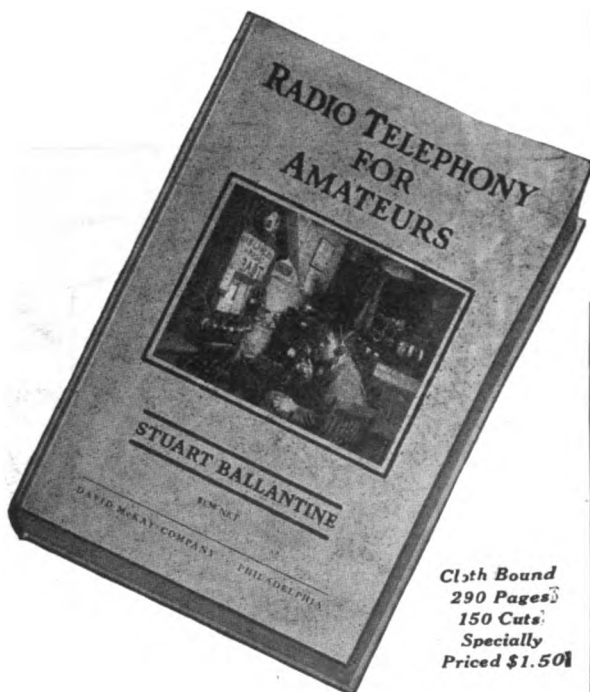
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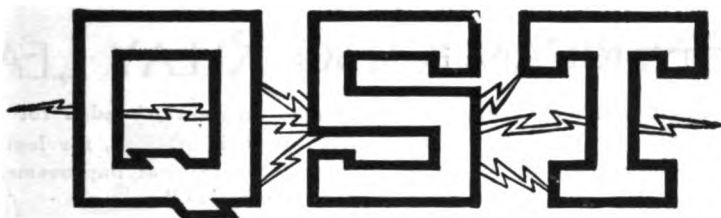
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SEPTEMBER, 1922

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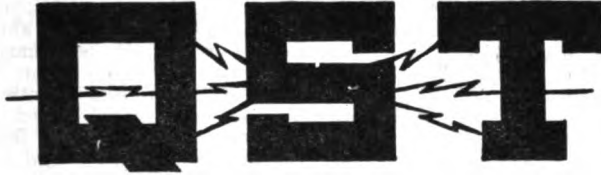
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A Magazine Devoted Exclusively to the Radio Amateur

Radio Frequency Amplification at Amateur Wave Lengths

By K. B. Warner

IT has been only a few months since we amateurs were commonly bewailing our inability to use radio-frequency amplification successfully at short wave lengths because of the inter-electrode capacity of our vacuum tubes. Of course we knew it was possible to do it using separately-tuned coupling circuits between the successive stages but that was a method requiring worlds of patience to say the least, and quite out of the question for amateur relay work. Then came rumors of successful circuits that worked well with several stages when coupled by some new trick transformer that was being put on the market, and shortly, almost before we knew it, there were numerous makes of such transformers offered the amateur world and more were coming every day.

With the advent of all of these transformers manufactured by perfectly reputable companies, numerous questions arise in the mind of the practical amateur. Do they really work? Are they as good as our present amplifier equipment? Are they sufficiently reliable for relay work? Are they worth the effort and expense? What does one do to make them actually work? And so on. Now the author is a practical telegraphing amateur and cannot help but view every radio innovation from that angle and consequently these questions and a great many more of the same sort occurred to him. In recent weeks numerous articles have been written on the subject but they have not answered these questions; indeed many of them look like they were written with no understanding of the subject; they are evidence of the keen desire for knowledge of how to apply this form of amplification practically, yet they haven't filled the bill. *QST* accordingly resolved to get the done if it were to be had, and to this end addressed a rather fearsome questionnaire to representative manufacturers of radio

frequency transformers. For much of the information herein we are indebted to the American Radio & Research Corp., the Coto-Coil Co., the Radio Corporation of America, the Mu-Rad Laboratories, and the Radio Instrument Co., for their comprehensive replies to our queries. The information we present is in the form of a composite, assembled from many sources, and will not always apply literally to every type of manufactured amplifying transformer. We believe, however, that in the main it is entirely accurate and reliable and may be used as a guide by the practical amateur in the selection of his amplifying equipment.

An Early Method

Perhaps the simplest workable method for inter-stage coupling in short-wave R.F.A. (radio frequency amplification) is the use of a tuned impedance, as described on page 57 of *QST* for last November and on page 35 for February last. This impedance may well be a variometer, and the possessors of the variometer-tuned plate-circuit receiver can rig up a single-stage R.F.A. with no additional expense than that of the tube and its appurtenances. It works pretty well, probably with considerably greater amplification than newer methods provide in any one stage, and if one stage were sufficient we think nothing further would be necessary. However, such an arrangement must be carefully tuned for each wave length and when several stages are desired the multiplicity of adjustments becomes so complex as to put this method completely in the discard. American manufacturers have been at work to develop a scheme whereby this exact tuning for every minor change in wave length would be eliminated, so that the amplifier would operate over a substantial frequency range just as an audio amplifier does. It is the result of their labors which is described in this ar-

ticle, and it takes the form of a radio frequency transformer, in most cases a two-winding transformer altho at least one firm is obtaining excellent results with an auto-transformer arrangement, and it may be air-core or iron-core. With such transformers it is possible to build a multi-stage amplifier in which no adjustment is necessary when tuning from one wave length to another.

R.F.A. Practicable

Because of the concentration of talent which in late months has been directed on the problem of R.F.A., a very remarkable development has been made and radio amplification on short waves is now undeniably successful. There is plenty of room for improvement in design and construction, some of the manufacturers freely admit that their products can be vastly improved upon for 200-meter work and some transformers in

then it ought to work several times better with a radio amplifier ahead of it. *This is not true.* It is almost impossible to make use of regeneration as we commonly know it in connection with R.F.A. on short waves. Some such effect as regeneration of course occurs as a feedback thru the capacity of the tube and is controllable as hereinafter described, but the more usual methods of reaction, such as a plate variometer or a tickler, commonly are abandoned. Intentional regeneration *may* be used up to a certain degree but is so extremely critical in a set which is properly amplifying that it is not recommended except to the most skilled of amateurs. None of the five firms whose assistance we solicited makes use of regeneration. This introduces a most important factor into the consideration of R.F.A., and one which must be considered by every user: it takes two stages of R.F.A.

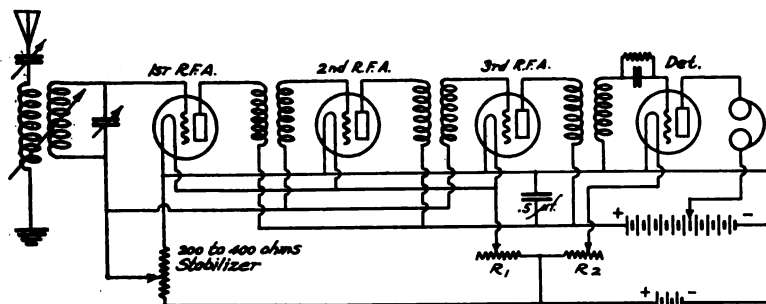


Fig. 1 Three radio stages on a common rheostat, and a hard detector tube — the favored circuit.

fact are quite impossible for amateur work, and there is added difficulty because R.F.A. is a new subject and rather fussy in the adjustment of some of its features. Likewise it has its limitations, as we shall shortly point out, and perhaps it is not to be compared with the super-regenerator or the super-heterodyne, but the former has hardly been reduced to a practical working device as yet and the latter costs money because of the unavoidably large number of tubes required. In the meantime R.F.A. looms large in many possibilities and it may be said that it is entirely feasible, one of the most effective ways of receiving, and in many respects easier to operate than the conventional receiver.

The Sacrifice of Regeneration

While regeneration of a fashion is obtained with the simple one-stage circuits previously referred to, every experimenter who has worked with R.F.A. thru the medium of the manufactured transformers now on the market has been perplexed at his apparent inability to make use of regeneration as commonly obtained. He has reasoned that if a regenerator gave a certain performance on a detector tube alone,

preceding the detector before any benefit is obtained over a regenerative detector alone. It takes about "a stage and a half" to compensate for the loss of regeneration; in other words, a non-regenerative detector with one radio amplifier ahead of it commonly will not be as sensitive as a regenerative detector without amplification, while with two radio stages preceding it, it will be somewhat superior. Additional stages of course will make it incomparably superior, but it is distinctly to be understood that a total of at least three tubes is going to be utilized by the operator who expects to improve his results by the use of R.F.A. The reason for this is that regeneration is itself the simplest and most effective kind of radio frequency amplification, equal, indeed, to something between one and two stages of transformer-coupled R.F.A. as obtained with present models. Therefore, until several tubes are put into service, no gain is experienced.

With sufficient tubes, three or more, the gain in R.F.A. is wonderful, but if only two tubes are available they should be used as a regenerative detector and audio amplifier, respectively; and if a total of three are at hand they should be used

either as a regenerative detector and two audio stages, if at least a moderate signal strength is important, or as a non-regenerative detector preceded by two radio stages, if maximum sensitivity (range) is desired and low audibility is no hindrance. The actual receiving range of the last-named arrangement is the best of the three but except for signals at its extreme range it will not give audibilities at all comparable with the regenerative detector with one audio stage. More about this comparison later.

These values are an average of the performance claimed on 200 meters for the factory-made transformers now on the market, and of course vary with the make. On 360 meters it is altogether probable that

sense adaptable to amateur relay traffic as we know it. Instead we are using transformers somewhat less sensitive in results, much less selective and with our dependence for selectivity placed in a loosely-coupled tuner, and thereby we secure a device which operates over a considerable wave band without readjustment.

The Number of Stages

In its present state of development there is a limit to the number of stages of R.F.A. which may be employed successfully on amateur waves. That limit is the building up to a condition so sensitive that it is impossible any longer to control conveniently the tendency to self-oscillation brought about by static coupling between

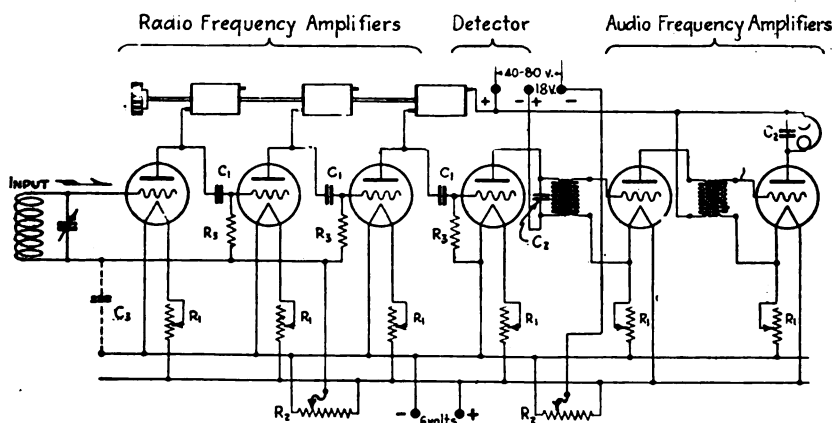


Fig. 2—Reactance couplers for three radio stages, soft detector and two audio stages, all with separate rheostats.

one radio stage will compensate for the loss of regeneration, whereby two stages would be several times more sensitive and three stages enormously better.

British amateurs have developed the R.F.A. portion of their circuits to a further degree than we have, and some notable success was achieved by them in this direction during the Transatlantic Tests. Their greater activity in this field is attributed by Mr. Godley partly to their failure fully to appreciate the advantages of the tuned-plate-circuit regenerator, and to their lack of gaseous detectors. Their successful work on the waves as short as 200 meters seems generally to have been accomplished by interstage coupled circuits separately tuned by condensers, and altho we freely admit that results are obtained thereby perhaps noticeably superior than with the fabricated transformers on the American amateur market, it is to be noted that such an arrangement is at best a laboratory experiment, necessitating the careful adjustment of every circuit by means of a wave-meter whenever the operating wave is changed, and is in no

the input and the enormously-amplified voltages of the output, and also by some direct feedback in adjacent wiring. Very naturally the number of stages depends upon the amplification constant per stage and the difficulties of increasing the number are more serious the higher the amplification per stage. For example, the British "55" seven-stage amplifier gives an amplification of only two or three times per stage, which is what makes it possible to use seven stages. Compare this with sets using our new transformers in which the voltage step-up per stage is sometimes as high as 80 and it will be seen how the signal voltage on the detector may very quickly be built up to a value where extreme care in wiring and shielding is necessary to prevent self-oscillation. At present we cannot exceed three or four stages, depending upon the make, before the voltages build up to a value likely to send the whole circuit into oscillation without control. It is expected, however, that methods shortly will be devised whereby several additional stages may be kept under control.

Radio vs. Audio

A reasonable comparison between R.F.A. and A.F.A. can hardly be made, because the principles differ radically. There is no question but that a stage of audio amplification increases the audibility of a reasonably strong signal much more than a stage of radio amplification does, because the detector will handle at best only a certain amount of power, but it seems to be a thoroughly-established fact that A.F.A. does not increase the *range* of a receiver, it is said that a signal which cannot be heard on a detector alone, under perfectly quiet surroundings, cannot be heard with any amount of audio amplification. In fact, if the signals are weak it is possible that a stage of A.F.A. will increase the tube noises and other undesirable sounds in greater proportion than the desired signals and actually make the latter unreadable.

taken of the directional selectivity and better signal-stray ratio of such devices.

The gist of the whole matter is that a stage of radio amplification enables a stage of audio amplification to work to far better advantage. Both are necessary. Audio amplification is by no means to be discontinued. The decided improvement which radio amplification gives cannot be realized unless audio amplification is used too. "Audio for audibility, radio for range."

The chief disadvantage of R.F.A. is the expense of the additional tubes and sockets and the batteries for their operation. Considerable hope for improvement in this respect is held out in schemes for simultaneous radio- and audio-amplification on the same tubes, such as that given by Mr. Stone in November 1921 *QST*. British amateurs already are experiencing very good results in this manner.

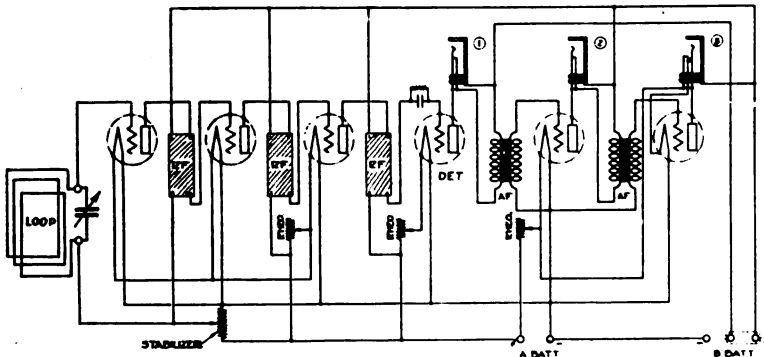


Fig. 3 Loop reception on three radio stages, operating on one rheo, hard detector, and two audio stages on a common rheo.

On the other hand an additional stage of radio amplification unquestionably increases the range, and signals which are inaudible on a detector can be brought in very nicely thereby. This is because of the so-called "threshold" value of incoming signal voltage below which a detector does not respond noticeably, and it is the purpose of R.F.A. to boost up the incoming voltage to a value which will operate the detector. This it does with practically no tube noises, because such noises are audio frequencies and are not transferred thru the radio stages. Since R.F.A. extends the receiving range, its value is chiefly in amplifying weak signals, and it is a fact that strong signals such as local ones are scarcely increased at all by radio amplification—thereby improving the reception ratio of weak and strong signals. Likewise we must claim for R.F.A. a greater "workability" because it makes possible operation on a loop or other small collector where advantage may be

Control

A set of cascaded radio amplifiers with unbiased grids will oscillate because of feedback thru the valve capacity, and such oscillation will build up to the characteristic limits of the tubes. Accordingly it is necessary to have some method of controlling the action, as obviously the tubes should not oscillate for the reception of damped or modulated signals. The common system employed for this control is the use of a so-called "grid stabilizer," which is nothing more than an A-battery potentiometer of 200 to 400 ohms to which the filament side of the R.F.A. transformer secondaries are connected in order that a positive bias may be put upon the R.F.A. grids. When the positive voltage on the grids reaches a certain value, oscillation is stopped, and the action of the amplifier may be varied by the stabilizer either to an adjustment just below the oscillation point, which, as might be expected, is the best for the reception of damped or modu-

lated signals; or the entire series of tubes may be permitted to oscillate at an amplitude controllable within limits by the stabilizer setting, for self-heterodyne reception of C. W. signals. We will have more to say about this. A common stabilizer for all the radio stages is generally sufficient where the same type of tube is used throughout. This stabilizer adjustment is very similar in its manipulation to the control of regeneration—in fact such a set may be appreciably easier to operate than an ordinary three-circuit tuner.

Instead of using a stabilizer some of the British experimenters control the tendency of the tubes to oscillate by coupling a tickler in the reverse of normal direction, so that instead of feed back for regeneration its tendency is to neutralize oscillation. Thus by varying the coupling of such a reversed tickler sufficient "positive resist-

autodyning; by adjustment of the stabilizer the set may be caused to self-heterodyne but the C.W. signals received are extremely feeble and entirely unsatisfactory. It is possible that with some types of R.F.A. transformers, if equipped with shielding filters in the detector and audio circuits, satisfactory self-heterodyne action can be had over a respectable portion of the wave length range. This is not to be recommended, however, because in oscillation the set radiates strongly and at least under stabilizer control its adjustment for optimum amplitude of local oscillation is so uncertain that the results are far from satisfactory, as might be expected in a control designed primarily to keep a set from oscillating. For flexible results in C.W. reception over all the wave length range of the transformers, a separate heterodyne should be employed.

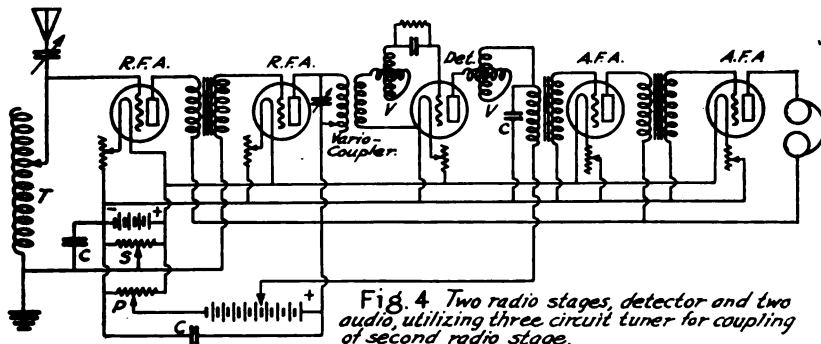


Fig. 4 Two radio stages, detector and two audio, utilizing three circuit tuner for coupling of second radio stage.

ance" may be introduced into the grid circuits either barely to restrain oscillations or the tubes may be permitted to oscillate gently with the amplitude determined to a nicety by the coupling control. In cases where the use of a stabilizer shifts the axes of grid oscillation of certain tubes to an inefficient point on the characteristic curve in order to curb the tendency towards self-oscillation, it is altogether conceivable that better results would be had by the reversed-feedback method, where grids could function at the point of best amplification and the undistorted amplifier output be controlled by the tickler coupling. This idea will well bear looking into both by amateurs and by manufacturers.

C.W. Reception

There is diversity of claims on the part of the manufacturers on the question of C.W. reception on their radio amplifiers. The manufacturers of air-core transformers in the main seem to believe that it can be done, while the iron-core makers recommend a separate heterodyne. The writer knows from experience with the latter type that it is practically impossible by

We suggest to the manufacturers of radio amplifiers that a separate heterodyne would sell well as an auxiliary to R.F.A.

In connection with C.W. reception it is interesting to note the following extract from Ballantine in his new book "Radio Telephony for Amateurs." In discussing phone and spark reception he says: "If radio frequency and audio frequency amplifiers can be built with equal effectiveness the first method is inherently superior to the second—solely on account of the peculiarities of the detector. With heterodyne reception of C.W. signals this does not apply, for in this case the response varies as the first power of the signal voltage and the two methods are, at least from this point of view, equally effective." Altho this is a theoretical consideration and there are other considerations in practice which modify it somewhat, nevertheless R.F.A. offers a greater advantage to the receiver of damped and modulated signals than it does to the C.W. telegraph operator.

Design Considerations

Several forms of R.F.A. transformers are available on the amateur market. Most of

the manufacturers seem to have proceeded on the idea that resistance coupling was hopeless, reactance coupling fair, and transformer coupling best. Most of the designs therefore are two-winding transformers. Such a device is known to be best but with common air-core design it responds to such an extremely narrow band of frequencies



The Amrad
2-Stage R.F.A.
using their
plug-in type
"Radiformers."

that its use is limited, without a multiplicity of adjustments which cannot be countenanced. Accordingly we find most of the transformers fitted with iron cores—after the practice of M. Latour—thin laminations of "high frequency steel," for the purpose of broadening the band of response, a few designs with cores of electrolytic iron either loose or formed under pressure with a binder, and only one manufacturer of two-winding transformers



The Amrad "Radiformer"

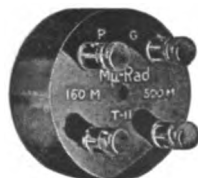
seems happily to have been able to solve the problem of broadening the wave band without the use of iron, which unfortunately gives rise to unavoidable core losses, particularly on the shorter waves, with loss of amplification. The figures quoted in this article apply to the average iron-cored transformer, however, so it will be noted that their performance may still be considered a practical solution of the R.F.A. problem.

In England a considerable discussion has been taking place in scientific circles re-

garding the action in R.F.A. transformers, it being vigorously held that when the two windings of such transformers are tightly coupled there is little of the true transformer effect and that the main transfer of voltage to the succeeding grid is attributable to a capacity effect between the windings; from which the conclusion is reached that reactance coupling is just as satisfactory as the more complicated transformers. One American manufacturer, in an effort to avoid iron losses and still keep clear of the tuning problems of air-core two-winding couplers, has designed a tapped reactance, partly wound with resistance wire, which has but a single adjustment to vary it rapidly thru a series of narrow wave length bands in any of which it operates with the efficiency of the usual air-core transformer. Such an arrangement is markedly sharp in tuning, making even a single-circuit tuner selective in action, contrasted with which is the fact that the iron-core transformers somewhat broaden tuning and a receiver equipped with them is not commonly as selective as the conventional regenerator.

A review of the various types on the market shows that we have transformers

The Mu-Rad
Transformer



available with an average range of about 170 to 500 meters, which in the range from 190 to 220 meters may be expected to have around 75% of their maximum sensitivity. It is altogether probable that a special transformer for amateur waves would have a maximum at the desired spot even greater than that provided in the present wider-range transformers.

Not all of the R.F.A. transformers now on the market are suitable for amateur work, some frankly having been designed for the 360-meter broadcast wave, and the amateur purchaser should be careful to get transformers guaranteed to work on 200 meters and below.

Construction and insulation are equally important; there are some makes on the market with fibre insulation which show an insulation resistance as low as 5000 ohms between terminals with the windings disconnected, defeating the whole purpose of the transformer.

It is now definitely apparent that, at least with efficient transformers, a change in specifications is necessary in the transformers of succeeding R.F.A. stages. Briefly the reason is that the input impedance

of a tube depends upon the load in its plate circuit, the latter being reflected into the grid circuit thru the grid-plate capacity. It is obvious that the load in the detector output is different from that in the last amplifier stage, and this, in turn being associated with the detector tube input, is different from the impedance in the second amplifier stage, and so on; similarly the input impedance in which the signal voltage to be amplified originates is reflected into the plate circuit thru the tube capacity, and is different in the several stages. Consequently for maximum amplification the successive transformers should differ in their couplings and turn-ratios.

Circuit Arrangements

There is much less variety in the hook-ups recommended than there is in the transformers themselves. They differ only in details respecting rheostats, jacks, etc., and are primarily the same. The outstanding characteristic is the use of the stabilizer, to which is connected the filament side of the secondary winding of all of the R.F.A. transformers except the one immediately preceding the detector; for best detection this connection of the transformer preceding the detector is made direct to the filament, preferably the negative side.

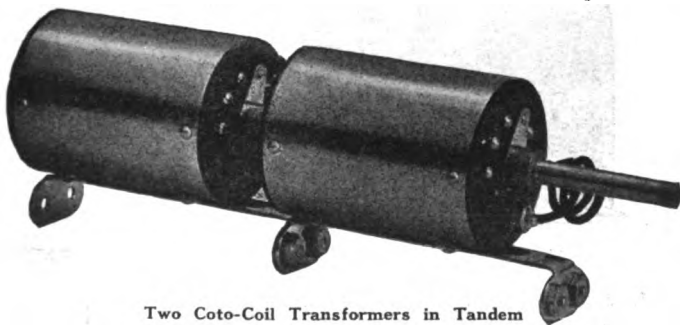
Figure 1 is a typical circuit for three R.F.A. stages and a detector. The three amplifiers operate from a common rheostat, and another is provided for the detector, which also operates from a tap on the B battery. The stabilizer connection will be clear from this diagram. The addition of the 0.5 mfd. bypass condenser makes the circuit considerably easier to control.

Fig. 2 shows an arrangement for the auto-transformer or reactance-capacity coupling. The coupling condensers *C*₁ are preferably .00025 mfd. in capacity, altho their value may be anything from .0001 to .0005 mfd. The leaks *R*₁ will vary with the type of tube but 1 megohm generally will be found satisfactory. *C*₂ is a bypass of about .0015 mfd. and *C*₃ performs the same function as the condenser in Fig. 1 and should be 0.5 mfd. Two potentiometers *R*₂ are shown; the one on the left is the stabilizer, which is connected to the grid leaks when reactance coupling is used; and the one on the right is the usual B-battery potentiometer for fine control of the soft detector.

In Fig. 3 is shown an arrangement of three radio stages, a hard detector, and two

audio stages, operating on a loop collector. The last three tubes are provided with phone jacks in their output circuits. This diagram otherwise will be self-explanatory.

Fig. 4 shows an arrangement whereby the usual three-circuit tuner may be used as the inter-stage coupling between the last R.F.A. and the detector. The actual tuner, *T*, is shown as a single circuit type and will be found sufficiently selective with the other adjustments provided. The vario-coupler of the tuner provides an air-core transformer of the best performance, its primary being tuned by the shunt condenser and its secondary by the series variometer, while the other variometer in the plate cir-



Two Coto-Coil Transformers in Tandem

cuit provides regeneration if same is wanted and to the extent that it may be found possible to use it. *S* is the usual stabilizer and *P* the potentiometer for the soft detector, which also is provided with a tap from the B battery. The condensers *C* should be of 0.005 mfd. capacity and are of help in preventing undesired oscillation.

Care in Assembly

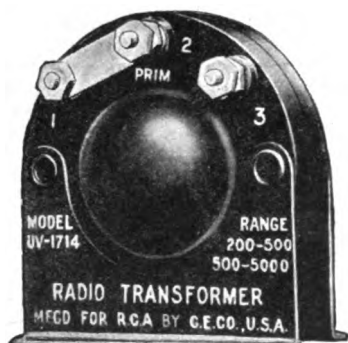
A great number of things that have no effect upon audio amplification have a great deal to do with the successful operation of R.F.A. and if not carefully considered sometimes make a set unsuccessful for no apparent reason at all.

The most important precaution is in the arrangement and wiring. The wiring must be reduced to the utmost in simplicity, with not a wasted quarter-inch of wire, but at the same time the grid and plate circuits must be spaced apart or run at right angles. An excellent idea is to arrange the pieces of apparatus in the same relation as they have in a symbolic hook-up and wire them up as nearly like the actual diagram as possible. In multi-stage sets a metal-lined box with separate compartments for each tube and its transformer, is often of help, the negative side of the battery being connected to the shield and to earth.

Extraneous capacity is to be avoided and tube sockets should be selected with care;

those with diagonally-mounted springs are best. With some tubes an additional C-battery of a few volts in series with the stabilizer arm (positive side to grids) will be of assistance in controlling oscillation.

The internal capacity of the tubes determines the lower limit of the wave length band over which the set will operate; consequently low-capacity tubes are to be preferred. The Moorhead A-P tube is most in favor for this season, followed by the



The R.C.A. Transformer

R.A.C. 3 audion, then the Radiotron. Most of the manufacturers recommend a hard detector tube but a soft one may be used with vast improvement in results if it is quiet in operation. Some tubes, thru freaks in manufacture, have excessively high internal capacity and make unsatisfactory R.F. amplifiers altho they may be excellent as detectors or A.F. amplifiers.

Some Types

In conclusion we present some data on a few types of transformers available. No attempt has been made to cover the field—these are merely representative of the various forms on the market.

Amrad: Of a style designed to plug into the standard four-prong tube socket, or it may be wired in the usual manner if desired; primary and secondary windings in the form of alternate pies, universal wound, on a high-frequency iron core. Present model designed for broadcast reception. Amplifies some as low as 200 meters and as high as 650 but with a pronounced peak at 360 meters; rated by manufacturers as 300-600 meters. A new model is promised soon, designed for amateur work. Supplied with one design for first stage and another for 2d and 3d stage.

Coto-Coil: A single-winding impedance coupling, roughly tuned by means of a 6-tap switch and with part of the winding of resistance wire (also a small strip of .0015 iron in the magnetic circuit) to broaden slightly the band of response. Minimum wave 180 meters; efficient maxima on

various switch settings, 220, 265, 315, 415, 540 and 750 meters respectively; may be stretched to 1000 meters. Several of these transformers may be connected in tandem and their switches operated by a common knob, preventing any complication of control. No information available on best wave length or on percentage of maximum amplification at 200 meters, but gives excellent results on broadcast wave with unusual sharpness of tuning.

Mu-Rad: A two-winding transformer without iron core, responsive over a band 170 to 500 meters with an air-core construction of patented design, eliminating iron losses. Supplied in models differing in coupling and turns-ratio for first, second and third radio stages. Claimed by maker that one stage is more sensitive than a regenerator at all wave lengths 170 to 500. Sensitive at 200 meters, design being such that that amplification at 200 is slightly greater than at 360, with another peak at 380 meters. Designed primarily for Moorhead A-P tubes.

Radio Corp. of America: Enclosed in steel stampings like their audio model.



Radio Instrument Co.'s "DX" Transformer

Made in two models, one for 5000 to 25,000 meters, with turns ratio 1 to 3; and another model for 200 to 5000 meters with a tap which divides it into two ranges at 500 meters, turns ratio 1 to 1; both models iron-cored. In the last-described model there are two ranges of maximum amplification, 360-400 meters and 600-1000 meters. Designed primarily for broadcast reception, on which wave length it seems to function excellently, but just begins to perform at 200 meters and rises rapidly in efficiency to 350 meters and above. Not suited to the amplification of amateur signals under 200 meters.

Radio Instrument Co.—"DX": A two-winding transformer wound on a straight open core of high-silicon steel of many thin

laminations; in appearance an oblong of 1-inch-square bakelite tubing with primary terminals at one end, secondary at the other, plugging into a special mounting. Same design used in each stage but three models for various wave length ranges: 170-450, 400-1200, and 900-3000 meters. Best amplification on the short-wave model is in the range 325-375 meters, with probably 75% of maximum amplification available at 190-220 meters. Works excellently on 200-meter damped and modulated signals.

Our Questions Answered

Thus it may be seen that rapid strides are now being made in the application of radio frequency amplification to short-wave amateur work, and the questions we had in our mind may now be answered; it really works, better than our present audio amplifier equipment, is well worth the effort and expense, and sets made along the lines suggested in this article will be found entirely reliable and fool-proof for relay work.

Notes on the Super-Regenerative Receiver

By L. M. Cockaday, 2XK*

THE latest invention of E. H. Armstrong is a development of such new and radical departure from any other receiving system that the amateur has to start all over again before he can become reconciled to its use. But it will come into extended use, in much the same manner as the inventor's previous invention, the simple regenerative receiver. After all, the newer device is an improvement over the older one; the ordinary limitation to amplification (self oscillation) has been overcome while at the same time the regeneration has been increased almost indefinitely. This fact alone assures the adoption of the circuit by the DX telegraphic amateurs in the future.

At present they have a sort of fear of tackling the job of making such a receiver or doing any experimental work with it, because of hearsay that it is too complicated, or that it is a trick circuit. Nothing of the kind. It's great, and it's simple!

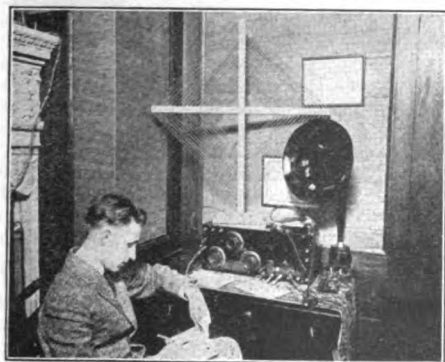


Fig. 3

As Mr. Armstrong has already explained the functioning of the three methods so clearly and his words have

been repeated in the press so many times we will not again repeat them here, but after stating these methods we will offer some notes gathered while experimenting with an adaptation of one of these methods.

First method: Super-regeneration may be obtained by varying the amount of regeneration with respect to the damping of the input circuit of the first tube. (Fig. 1, July QST.)



Fig. 4

Second method: It may also be accomplished by varying the damping of the input circuit of the first tube with respect to the regeneration. (Figs. 2 and 4, July QST.)

Third method: It may be obtained by varying both the damping and the regeneration with respect to each other, keeping the proper phase relations. (Fig. 3, July QST.)

The second method is recommended for the amateur's consideration because of the simplicity of construction and control and because it may be adapted to the reception of all types of signals.

The construction of a set embodying this principle is shown in Figure 1. The best results were gotten with this construction up to the moment of writing.

*Technical Editor, "Popular Radio."

The parts necessary are listed below with the same designations as shown in the photograph.

- C_1 —0.002 mfd. fixed condenser
- C_2 —0.001 mfd. variable condenser
- C_3 —0.0005 mfd. grid condenser and 2 meg leak
- C_4 —0.0005 mfd. fixed mica condenser
- C_5 —0.001 mfd. variable condenser
- C_6 —0.002 mfd. fixed mica condenser
- L_1 —Single layer solenoid as described
- L_2 —200-turn honeycomb coil
- L_3 —Variometer (one with high maximum and low minimum values of inductance)
- L_4 —1250-turn honeycomb coil
- L_5 —1500-turn honeycomb coil
- L_6 —Loop antenna as described
- R_1, R_2, R_3 —5-ohm rheostats
- J_1 —Double-circuit jack
- J_2 —Single-circuit jack
- T —Audio-frequency amplifying transformer

the inductance where different sized loops may be used.

The set as it was first made used a 3 volt biasing battery in the grid circuit of the tube V_1 , but the two binding posts for connecting this battery were shunted by a copper wire, it being found that the set worked just as well without any biasing batteries at all. The grid circuit of the tube V_1 contains the conventional condenser shunted by a grid leak. This is quite an advantage as two batteries are thus eliminated.

The diagram fully illustrates the connections to the binding posts on the front of the panel by comparison with the photo in Figure 3. The binding posts in the diagram are arranged as looking at the front of the panel. The loop used was wound on a cross frame (30 inches across the arms) and consisted of fifteen turns spaced $\frac{1}{2}$ inch between turns. Tubular braided wire was used as this was found to

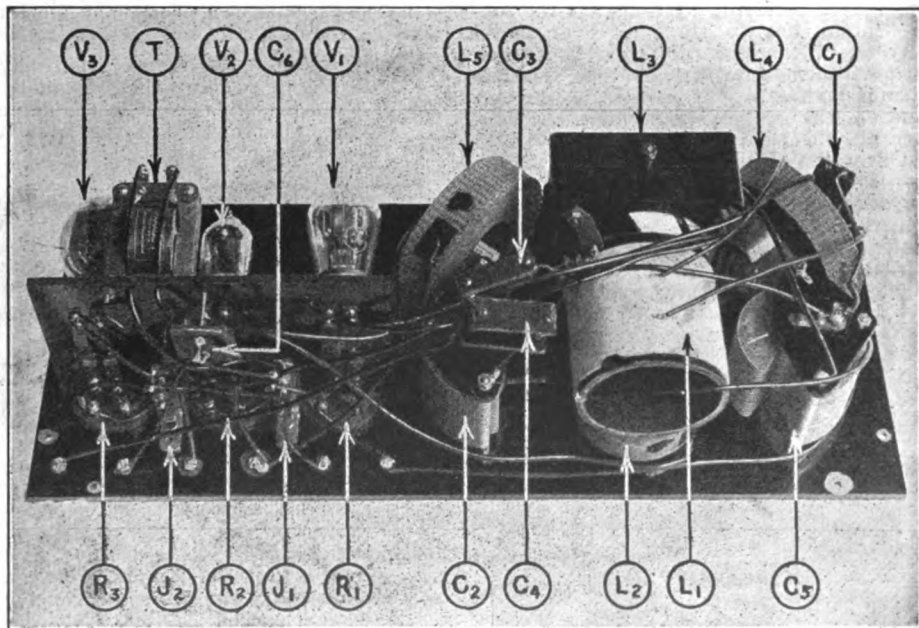


Fig. 1

- V_1 —Radiotron U.V.201
- V_2 —Moorhead or W.E. "J" tube (any hard tube will work)
- V_3 —Hard amplifier tube

The instruments are placed on a panel as clearly shown in Figure 1, and connected up as indicated in Figure 2 where the same designations are used throughout, so there can be no mistake.

The coil L_1 consists of a single layer solenoid of 60 turns with three evenly spaced taps brought out to binding posts for connection to the loop for adjusting

be far superior to any other wire for this purpose.

Looking at the set as shown in Figure 3, the lower left hand large knob controls the wave length (C_5), the top large knob controls the regeneration (L_1), and the right lower large knob controls the frequency of the tube V_3 (oscillator). For maximum amplification most of the capacity of this condenser (C_5) should be included in the circuit, but for the clarity of telephone signals and C.W. this will have to be forfeited a little by reducing the capacity considerably.

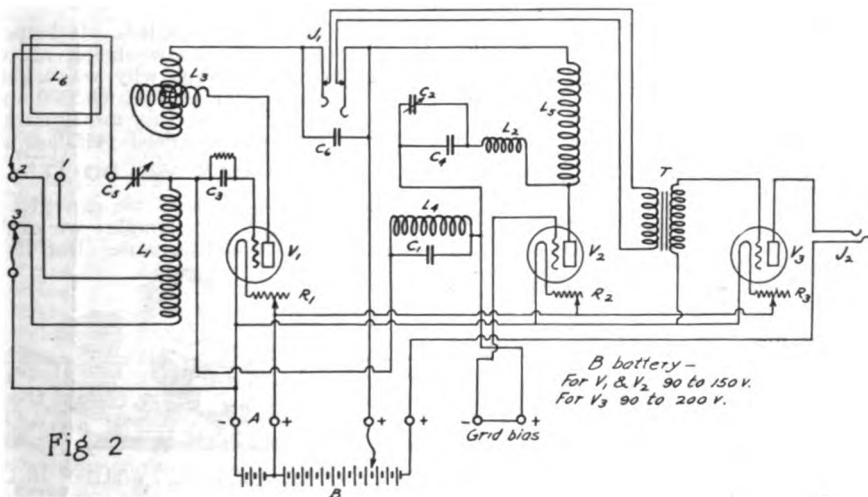
Of course we know that it has been generally understood that the super-regenerative circuit excludes C.W. because the oscillator tube stops the detector tube from oscillating, but nevertheless if the second tube filament is turned down to a rather critical point, the amplification is retained at a near maximum, and C.W. signals can be received.

The only explanation we can offer is that when the second tube filament is reduced in brilliancy, the amplitude of the oscillations generated by the tube is decreased,

100 setting on the scale, the amplification will be increased although interference from the oscillator frequency will be noted.

It will be noticed that in this circuit no filter is used except the by-pass condenser C_1 which is connected across the primary of the transformer T . This is all the filter necessary when using the first tube as the detector instead of the second tube as is ordinarily done.

There are four people in New York now using this type of set employing this circuit and they swear by it, and already other



Super-regenerative circuit employing 3 tubes described in this article. Note that no filter circuit is necessary and also that no biasing batteries are used. There are three taps on coil L_1 for correct adjustment for different fixed loops. The loop terminal should be shifted to 1, 2 or 3 and signals tuned in. The one that brings in the loudest signals at course is the one to use.

and their effect of stopping the detector tube from self oscillation at intervals is also reduced, thus allowing the detector to start oscillating at intervals between the slower frequency pulses of the second tube. This would produce an audio frequency beat when tuned properly with C.W. signals, which might at the same time be amplified, when its radio frequency component is fed back due to regeneration. This is only a theory, but the set actually picks up C.W. when in this condition very efficiently although with slightly different sounds than the ordinary regenerative set.

A different adjustment is required for spark—the filaments must be turned up higher; sparks at best sound mushy but can be read without difficulty although the true note is somewhat distorted.

For telephone reception the same procedure is gone through as for sparks, although the operator must make a choice between clarity of signals and degree of amplification. This adjustment is controlled by condenser C_1 ; with the condenser set nearer the 0 setting the quality will be improved and with the condenser nearer the

people are building them with success after seeing the set demonstrated. The writer has one of them mounted on his car as shown in Figure 4, with which broadcasting and amateurs can be heard for blocks.

With the few notes given herewith, any amateur should be able to construct a super-regenerative set that will work, and when he becomes fully acquainted with its operation, and really understands it as only operating experience can teach, he will also swear by it and very probably improve on its design for his own particular purpose.

Another Station in Hawaii

Radio Gunner T. A. Marshall, in Honolulu, has a 50-watt C.W. transmitter going now with about 4 amperes in the antenna, and some of the California stations should hear him. He is getting 6KA and 6ZG like local stuff and can hear almost everything going.

With "Malihini" and Dow both in T.H., traffic for the islands ought to be a cinch this winter.



ATTENTION! HEADS UP! QST is going to have a real subscription contest! Flattering ourselves that it does every radio man good to read QST, we want some more subscribers, and we're going to make it immensely interesting for A.R.R.L. folks to help us get them. We think a great big lot of subscriptions can be secured just now and so we're perfectly willing to offer a great big lot of prizes. We're going to bust all records for subscription prizes by offering a series of **FIFTY PRIZES** in radio apparatus totalling **TWO THOUSAND DOLLARS!** Yes, sir,—

50 PRIZES TOTALLING \$2000.00

Get your breath, O.M., and read on. Do you realize that now is the psychological time for a sub contest? We've got ten thousand members of our A.R.R.L. who are real amateurs, who have known all about QST for years, and who are capable of forming themselves into the most efficient fleet of subscription-takers you ever heard tell of. Then, starting this month, we have about two million radio fans who are prospects—folks interested in radio, blindly floundering around trying to find a radio magazine that will tell them something interesting, and all primed waiting for an A.R.R.L. member to show them what a QST looks like and put them on the books

to learn about our A.R.R.L. It helps amateur radio, you know—helps all of us. Those are the reasons why we're going to have a subscription contest with 50 amperes in the antenna—and this announcement is the surprise we promised you last month.

HOW CAN WE DO IT?

How do you suppose we can give away all this money? It's simple: we can't, unless we get the subscribers. But if we do



ODDLES OF CATALOGS FROM WHICH TO CHOOSE

get them we can set aside so much from each subscription, the same as if it were commission to a regular agent, and we can apply the fund thereby created to the purchase of prizes for the fellows who do the work—A.R.R.L. co-operation.

A string of fifty prizes gives a chance to everybody who's willing to work hard. There will be great big prizes, medium sized ones, and little ones, graduated all down the line. Of course we have to arrange it so that we at least make expenses in the contest and that means that we have to place a "threshold minimum" on each prize, because if we only had two contestants and they only turned in a couple of subs apiece we couldn't give away \$2000. The big prizes can only go to the fellows who work like the dickens and produce some wonderful results, but the big feature that distinguishes this contest from all others is that it provides some really big rewards for the chaps who can deliver the goods, and at the same time it offers handsome prizes for the results that a magazine would experience in an ordinary subscription contest, and yet it still provides a large number of additional smaller prizes so that the contestants who show any pep at all are certain of finding it more than worth their while.



MAKE IT BE YOUR NAME THAT THE EDITOR PUTS ON THIS ORDER

for a year or two. Now is the time for all good men to come to the aid of the game. We want these subscribers badly; newsstand accounts are messy things to handle, and besides our advertisers consider paid-in-advance subscriptions as the main thing that counts, and, most important of all, we want as many as possible of the new-comers

HERE'S THE DOPE

What do you need for your station? Whatever it is, *QST* proposes to buy it for you. We're going to buy \$2000 worth of America's best radio apparatus from *QST*'s advertisers and give it to the winners in our contest. We don't know what it's going to be—it's going to be what YOU want. We're not going to offer a transmitting set as first prize and a receiving set for second prize because the fellow who wins first prize may need a receiver badly and not need a transmitter at all—we're going to let *him* be the picker. Whatever he wants is his. In other words, the \$2000 in prizes will be awarded in the form of any desired radio apparatus selected from the catalogs of *QST*'s happy family of advertisers. The distribution is as follows:

Grand First Prize, \$300 worth of apparatus

2d Prize	\$200	"	"	"
3d Prize	\$150	"	"	"
4th Prize	\$100	"	"	"
5th Prize	\$100	"	"	"
6th Prize	\$100	"	"	"
7th Prize	\$75	"	"	"
8th Prize	\$75	"	"	"
9th Prize	\$75	"	"	"
10th Prize	\$75	"	"	"
11th Prize	\$50	"	"	"
12th Prize	\$50	"	"	"
13th Prize	\$50	"	"	"
14th Prize	\$50	"	"	"
15th Prize	\$50	"	"	"
16th Prize	\$25	"	"	"
17th Prize	\$25	"	"	"
18th Prize	\$25	"	"	"
19th Prize	\$25	"	"	"
20th Prize	\$25	"	"	"
21st Prize	\$25	"	"	"
22d Prize	\$25	"	"	"
23d Prize	\$25	"	"	"
24th Prize	\$25	"	"	"
25th Prize	\$25	"	"	"
26th Prize	\$10	"	"	"
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38th Prize	\$10	"	"	"
39th Prize	\$10	"	"	"
40th Prize	\$10	"	"	"
41st Prize	\$10	"	"	"
42d Prize	\$10	"	"	"
43d Prize	\$10	"	"	"
44th Prize	\$10	"	"	"
45th Prize	\$10	"	"	"
46th Prize	\$10	"	"	"
47th Prize	\$10	"	"	"

48th Prize	\$10	worth of apparatus
49th Prize	\$10	" " "
50th Prize	\$10	" " "

\$2000

Say, O.M., what would you do if you were told you could have \$300 worth of new apparatus? We're going to be real mean and tempt you. Do you know that \$300 will buy you everything you can think of for a 100-watt C.W. set—tubes, sockets, motor-generator, transformer, meters, everything from soup to nuts? Or, supposing you have an A1 transmitter stop a min and consider that a super-heterodyne wouldn't make a bad receiver for this next winter and reflect upon the fact that \$300 will buy everything that the human mind can devise in the way of parts for rigging up a real one! Or suppose you are a laboratory hound but need the jack for some real meters and precision instruments—some real condensers and some inductance standards and a capacity meter and things that you dream of but don't know when you're going to get—*QST* is perfectly willing to hand them to you on a silver platter for a



THE MOST UNEXPECTED
FOLKS ARE PROSPECTS
JUST F'INSTANCE THE
FAMILY DOCTOR.

little hard work on your part. Think of the third prize, even—if you need anything in ordinary receiving equipment, for example, that will buy you the finest short-wave regenerative tuner in America and add a bang-up good two-step amplifier to the bargain. Suppose you didn't win anything higher than sixth prize, it's a whole big hundred dollars, and a hundred dollars means a pile of apparatus when a fellow makes up a list of what he needs—it isn't many of us who can drop casually into a supply store and buy a hundred dollars worth of apparatus whenever the fancy strikes us. Yet nothing will give *QST* greater pleasure than to send \$100-worth of equipment to you—stuff of your own picking. By the way, O.M., how'd you like to have a nice lil C.W. set with four 5-watt tubes—you know, perfectly capable of covering from 6ZAC to French 8AB under the right conditions—how'd you like that? Parts for a mighty nice one, including tubes and meters, for a hundred washers. Even if you won tenth prize and wanted such a C.W. set, the \$75 tenth prize is still enough to buy almost everything necessary.

What do you think of super-regeneration?

Or have you your doubts about this radio-frequency amplification stuff? Would you like to try them and see for yourself? Costs money to experiment—unless you let QST buy your stuff for you. Just think—even down to the fifteenth prize the amount is \$50.00!

You see, fellows, it's you chaps who are practical amateurs to whom we are making this offer—you're the folks who need apparatus and at the same time you're the ones who can get out and tell the world about QST. Do you get our idea? We're not offering you a nice pretty rotary gap for a prize when mebbe you junked the spark a year ago—we're letting you DO YOUR OWN PICKING—but by heavens if you want a spark set all you have to do is hump a little and we'll send you a Type E transformer and a made-to-order he-gap on a big synchronous motor and a condenser that will hold the beast and an oscillation transformer out of 1-inch copper pipe and a barrel of porcelain insulators for an antenna—just let your imagination run riot: you can't think of anything we won't get for you if you'll do your part.



Even if you live in a little village and your possibilities are extremely limited, we're offering a total of FIFTY prizes and surely there's lots of room for you. Even those last prizes are worth \$10 and that means that for a very small effort on your part you can have the makings of a step of amplification or that meter you've wanted, or a couple more tubes, or a REAL pair of phones—doesn't make any difference to us.

MINIMA

Now about those "threshold minima"—of course we have to require a minimum number of subs to qualify for the various prizes, as we can't afford to let some bird walk away with our \$2000 for ten subscriptions. The First Prize goes to the contestant turning in the greatest number of subscriptions, the Second Prize to the one with the second greatest number, and so on down to the Fiftieth Prize, BUT—

In order to be eligible for the Grand First Prize of \$300 you must turn in at least 500 subscriptions.

In order to be eligible for the Second Prize of \$200 you must turn in at least 400 subscriptions.

In order to be eligible for the Third Prize of \$150 you must turn in at least 300 subscriptions.

In order to be eligible for Fourth Fifth or Sixth Prize of \$100 each, you must turn in at least 200 subs.

To be eligible for any of the four \$75 Prizes, Seventh to Tenth inclusive, you must turn in at least 150 subs.

For any of the five \$50 Prizes, Eleventh to Fifteenth inclusive, you must turn in at least 100 subs.

To be eligible for any of the \$25 Prizes, of which there are ten from Sixteenth to Twenty-Fifth inclusive, you must turn in at least 50 subscriptions.

To be eligible for any of the twenty-five \$10 Prizes, numbered from Twenty-Sixth to Fiftieth, inclusive, you must turn in at least 25 subscriptions.

In our previous subscription contests our Main Prize has been \$50. Just think—in this one the prize values even down to the Fifteenth Prize are as high as \$50.00! If we offered merely the last 36 prizes listed, this would be better than any of our previous contests, but we've added 14 bigger prizes running into real money for the men who mean business.

THE GUN IS FIRED

WE'RE OFF! This subscription contest is hereby declared open immediately. It will run until November 10th, seventy days. By the time you finish reading this you will have decided you want to enter, and the thing to do is to write a letter at once to the Contest Manager and ask to be entered and to send you some subscription blanks PDQ, and meanwhile you get busy lining up your friends. You'll have to

work like sixty but that's all there is to it. As you send in the subscriptions you get, with a money order to cover the amount, we'll keep careful score and we'll get out bulletins to contestants every week that will show your standing. That's simple, isn't it?

Fellows, this thing is a cinch! The country is lousy with folks wildly interested in radio and you ought to get subscriptions from every one you meet in not more than two minutes. Every aerial marks at least one prospect! QST will do these folks worlds of good, because they're looking for something nowadays that will answer their questions and not merely amuse them with pretty pictures, yet they've never been told about QST. That's all you have to do. Every little village has a hundred or more of them and in the cities they run into the tens of thousands—really! You've seen hundreds of single-wire aerials as you go about your home-town, haven't you? Put some sample copies under your arm, your

you had to dig to find folks outside the amateur class who were interested; once in a while you would find that your doctor or minister had a streak of wireless interest but it was rare. To-day? Shucks, there're MILLIONS of them!

QST's idea in this contest is to provide intensely interesting possibilities for the contestant in every kind of locality and particularly appealing incentives for real workers. Have you spare time which you would like to turn into radio-cash? Here's your chance. Are you out of work and yet wild to get some new stuff for this winter? Oh boy, here's your meat! In fact, daggone it, we aim to make this contest so interesting that it's worth any ham's time to take a week of his vacation and do nothing but work for us—it's awfully hard to earn \$300 in a week any other way. If you're serious about this thing you can think of dozens of ideas which will help you: you're not necessarily limited to your own home town; borrow the family fivver some day



sub blanks in your pocket, and armed with your best smile you drop around and see these folks. Presto! a subscriber—just like that! You don't have to know them—you're limited to your personal friends—your prospects have a sign hanging outside the house right now—every aerial means a ten-to-one shot for a sub.

Then think of the crowds around the radio supply stores at noon—go get 'em! And the membership of your radio club, which is many times what it was when we held our previous contests—line 'em up. your amateur friends—get them to help you, solicit their own renewals to QST. Do you know that the winner of the First Prize in our last contest lived in a very small town and won first honors by taking subscriptions from all his friends *over the air*? You can do that too. Why, when we ran our last dinky little contest it was a hard job to sell subscriptions; of course every radio amateur would subscribe but

and chase over to the near-by towns and go over them with a fine-tooth comb too, and don't miss any aerials on the drive over; and what's the matter with a little ad in your home-town newspaper, if you mean business?; there's no limit to the possibilities!

Now let's put all of these ideas into the form of regulations to govern the contest:

RULES OF THE CONTEST

(1) This contest is open to any member of the A.R.R.L., but only to members. Entries will be received only from individuals.

(2) The contest is declared open with the publication of this issue of QST. It will close at midnight on November 10, 1922. To be fair to contestants in the western states, subscriptions addressed to us may be placed in the mails in your town up to midnight of that date—the cancelling stamp of your post-office will be the guide. Subscriptions filed in the mails

after midnight of Nov. 10th will not be counted.

(3) Fifty prizes totalling \$2000.00 in value will be awarded as hereinbefore described, subdivided as we have listed; and in order to qualify for any prize listed the minimum number of subscriptions specified therefor must be turned in. The right is reserved to withhold any prizes not qualified for by the submission of the specified minimum of subs.

(4) Only full-year subscriptions at \$2.00 each will be received in this contest. They may be new subscribers, renewals, or extensions of existing subscriptions. Full amount must accompany the filing of all subscriptions.

(5) To enroll in this contest, submit your name and address to the Contest Manager, QST Subscription Contest, 1045 Main St., Hartford, Conn. You will be sent immediately a few sample copies of QST and a supply of special subscription blanks. All subscriptions must be filed on these special blanks, which must bear your name in order that proper credit can be

given you. Try to anticipate your needs for further blanks by requesting them sufficiently in advance, but if you run short WIRE US.

(6) The prize winners will be announced in QST for December. The value of the prizes will be awarded the respective winners in the form of any apparatus, equipment, supplies or parts which they may select from the catalogs or advertisements of any QST advertisers, and will be delivered without expense to contestants. If a contestant desires apparatus valued in excess of the prize won, QST will purchase it for him if he will deposit the difference in value with us.

Are you out for blood? Whoop her up, you chaps, and get going. The first workers in each community get the easy nickin's, and you don't want somebody else to scoop up the gravy in your village. We'll buy your new apparatus for this coming winter's season if you'll send in your name for enrollment and get a supply of blanks. Do it right now!

CONTEST MANAGER, QST Subscription Contest,
1045 MAIN ST., HARTFORD, CONN.

Progress on Super-Regeneration

By K. B. Warner

AS far as concerns the reception of long-distance damped and modulated signals, super-regeneration so far has failed to live up to expectations.

By this writing a great number of amateur experimenters have got into motion and slowly we are beginning to accumulate a fund of practical data acquired in the hard school of experience. Almost all of these experimenters have secured some measure of success but not of the order expected. In most cases absolutely terrific local signals have been obtained, and within say fifty miles of broadcasting stations the reception has been about all that could be desired; but when it has come to trying for long-distance 200 meter amateur spark telegraphy the attempts have been flat failures in every case which has come to our notice.

This is a sad disappointment. Let us look into the matter and see if any reasons can be found for this failure. In the first place if there are any signals present from nearby stations they will be amplified—never fear—to such a volume that the phones can't be worn for any length of time; that in itself precludes much DX work: one can't expect to fish for weak sparks two thousand miles away while a half-horse-power of sound energy from a

sink gap ten miles away is being squirted in one's ears. Then again the super is full of strange noises and critical in its adjustments; doubtless these defects can be eliminated but so far they have handicapped operation. There is still another reason for this lack of success, however, and we believe it is the basic one. In his paper before the I.R.E. Mr. Armstrong presented oscillograms of the tube action. Let us quote from his paper:

"...These oscillograms show phenomena which are in accordance with the explanations already given, but, in addition, show evidence of self excitation. It has been stated in the preceeding pages of this paper that the basis of super-regeneration was the discovery that a variation in the relation between the negative and positive resistances prevented a system which would normally oscillate violently from becoming self-exciting. An examination of the oscillograms will show that this is not strictly true, as a free oscillation starts every time the resistance of the circuit becomes negative. It will be observed, however, that this free oscillation is small compared to that produced by the signal, and therein lies the complete explanation of the operation of the system."

It seems to us that the above paragraph

explains the trouble. Super-regeneration does not entirely prevent self-oscillation. As far as moderately strong signals are concerned, such as might be expected on a loop from a nearby station, the effect of these feeble local oscillations is entirely negligible—"and therein lies the complete explanation of the system." Now these weak locally-excited oscillations are initiated by some irregularity of operation of the tubes, such as a miniature volcanic eruption in the filament emission, and the

strength from 100,000 to 1,000,000 times, perhaps, but increase in *receiving range*, no! We may be wrong, but as we view the matter to-day the chief appeal of this particular form of super-regeneration is going to be for loud-speaker reception of nearby broadcasts by the "cliff-dwellers" of big cities where it is impossible or undesirable to erect an outdoor aerial and where operation will be confined to short distances. As a result, the system has been dubbed "stupid-regeneration."

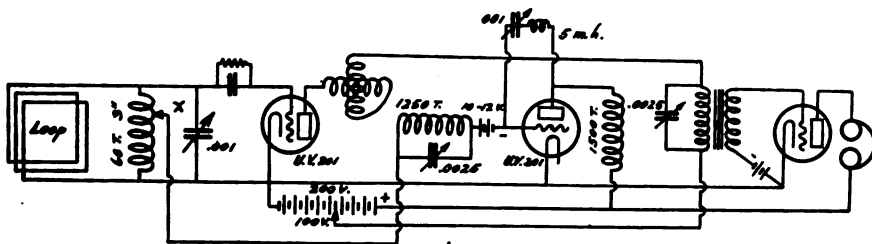


Fig. 1

original effect is of infinitesimal order, but it builds up rapidly during all of the period that the circuit resistance is negative. Although negligible in the case of strong signals it seems entirely reasonable to consider that the amplitude of this free oscillation might be very formidable when compared with a *weak* signal; in which case the effect of super-regeneration wouldn't obtain for the weak signal—in fact, a weak signal would actually encounter an oscillating tube!

We are not trying to find theoretical fault with the system. It's the other way about: the system has failed completely in

We have been advised to use the super on'y on a loop. As a matter of fact it seems quite impossible on an aerial except under perfect atmospheric conditions. Strays and induction clicks and miscellaneous electrical disturbances are amplified to such an extent that a weak sig has no chance. The set must be operated on a loop and sheltered as completely as possible from stray electrical disturbances and at mospherics. Then if any strong signals are still picked up on the loop, the set will amplify them. That condition of course leaves very much to be desired.

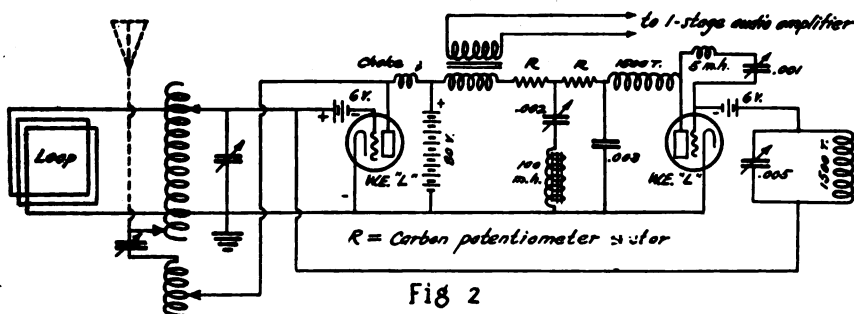


Fig 2

DX spark reception and we are trying to find a theoretical reason why. The above would seem to answer the question. It may be possible by some innovation or even by a more skilled operation of the present circuits to eliminate the tendency towards self-oscillation but until that is done the system does not compare, for DX damped reception, with an amateur short-wave regenerative circuit with a soft detector and two steps of audio amplification, *even on the same loop!* Amplifications of signal

Now to get over all this gloom, we have a pleasant surprise. The system is delivering the goods on C.W. telegraph reception in a most surprising manner. We say surprising, because here is a system designed not to oscillate but to regenerate, and to super-regenerate and still not oscillate, a system specifically designed for the reception of damped and modulated signals and supposedly incapable of C.W. reception without a separate heterodyne, and here it copies 'em like a charm. 2XX, for example.

is willing to say that on his 3-tube super, working on a nine-inch loop, he has copied more DX C.W. signals than he ever heard on any regular receiving set on an aerial, and 2BML substantiates him that it is F.B. Both use essentially the circuit of our August article.

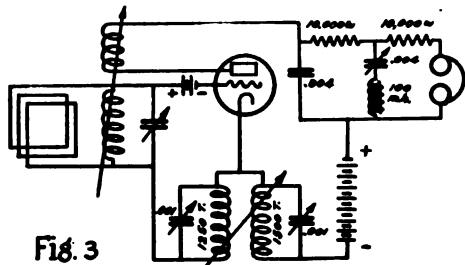


Fig. 3

Let us see if we can find an explanation for this unexpected C.W. reception. Frankly we don't know and are only guessing. 2BML believes it possible that he is heterodyning the incoming C.W. signal with some harmonic of his super-audible variation frequency, producing beats which then of course are amplified in the normal super manner. 2XK, after slightly rearranging his circuit so that detection is accomplished in the first tube and after carefully selecting his tubes for their jobs, picks up C.W. by decreasing the *amplitude* of the variation-frequency energy by dimming the generator tube filament. When we consider that the superimposed variation frequency alternately increases negative resistance, permitting free oscillation, and positive resistance, choking off the oscillations, and that normally a rather considerable amount of energy is required of the variation generator, it seems that perhaps by dimming the generator filament the ratio of the negative periods to the positive periods would be increased to an extent which would permit the heterodyning of incoming C.W. signals without the regenerative amplifier actually being in unrestricted oscillation. Still another possibility of accounting for C.W. reception is that these same feeble locally-excited oscillations which exist throughout the periods of negative resistance heterodyne the incoming C.W. In any event we may say that thru some attribute of one tube or the other, audible beats are produced which are then regeneratively amplified the same as telephone signals.

Progress

All these things mean progress. Already we amateurs are digging up real information on these circuits. This is exactly the condition QST hoped for in offering \$100 in prizes for the description of the best sets which are successful in receiving DX telegraphy. Altho it is very evident that the super-regenerator cannot hope to compete with the super-heterodyne, which re-

mains the last word in short-wave reception, it is so much simpler and less expensive that it justifies any effort to adapt it to practical amateur work. If any reader of these lines has not read about QST's contest, let him see page 10 of our August issue. Four prizes, of \$50.00, \$25.00, \$15.00 and \$10.00, are offered for the best manuscripts describing practical adaptation of the principle of super-regeneration to the reception of short-wave telegraph signals (but not especially telephony) received by QST up to Oct. 1st. This means one more month. Altho we have had an initial disappointment over super-regeneration, it has opened unexpected possibilities in another direction and there is all the more incentive to make it work.

As evidence of the trend which amateur work is taking in the simplification of the armstrong circuits, consider Fig. 1, a modification of our August diagram, which has been used with considerable success. The first tube is caused to do the detection, and a condenser with leak is employed instead of the C-battery; the regeneration is controlled by the ordinary plate variometer instead of the detested tickler; and the complicated and expensive filter-trap across the amplifier input (necessary to relieve the amplifier of the heavy component of variation-frequency energy) is simplified to a single large variable condenser across the inductance of the amplifier-transformer primary—it has to be tuned to the variation frequency, of course, but it eliminates the extra chokes, condensers, and resist-

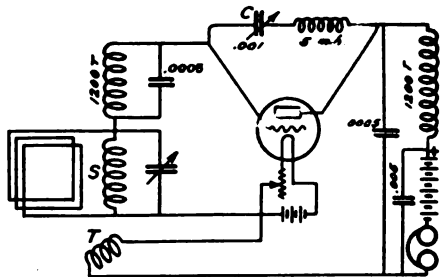


Fig. 4

ances. The loop is still shown shunted across the pick-up inductance, an arrangement which seems to give greater stability. Notice variable contact X, which is decidedly to be recommended for control of the resistance variation introduced into the regenerative circuit.

Mr. R. B. Bourne of 2BML has succeeded in adapting the ubiquitous Reinartz Tuner to super-regeneration in the circuit shown in Fig. 2, which in theory is quite the same as our August diagram and differs only in the practical differences made necessary by the Reinartz circuit arrangement. 2BML has had excellent results in the reception of phones and DX 200 meter C.W.

The set worked under disadvantages, as a loop was used in a radio shack entirely surrounded by a big counterpoise. 4DL in Palm Beach, Fla., C.W. was heard on the loop, and an amateur phone somewhere in South Carolina. Spark signals sound "frazzled" on this hook-up unless their decrement is very low. In fact this circuit is at its best in the reception of I.C.W., particularly 500-cycles-on-the-plate. 8AQO paralyzes the phones at 2BML, and 1VQ, using one 5-watt tube with some form of grid modulation, has been heard 600 ft. from the phones on the equipment indicated. Of course it is possible that 2BML is experiencing some kind of an antenna effect from his counterpoise, but if that's all that is necessary to make the super work we will all be willing to operate our loops under our aerial. 1FS, by the way, gets good results by hooking his antenna to the grid side of his loop but using no ground connection.

T is the usual plate variometer but inductively coupled to S, for signal-frequency regeneration. The coupling at variation frequency is accomplished thru the inter-electrode capacity of the tube and controlled by condenser C, which should have a small choke of about 5 m.h. inductance in series with it to keep out the radio frequency.

In conclusion we present a freak circuit (Fig. 5) for which we make no claims at all—we merely exhibit it as evidence of what a disordered mind will create after studying this super stuff for a few weeks. A member of the QST staff gave birth to this circuit while under the influence of hypnotism—no kidding. We haven't had time to try it but it seems theoretically sound and certainly original. The first tube is the regenerative detector and the second an audio amplifier, between which is a tuned filter to keep the variation-frequency energy away from the amplifier. The vari-

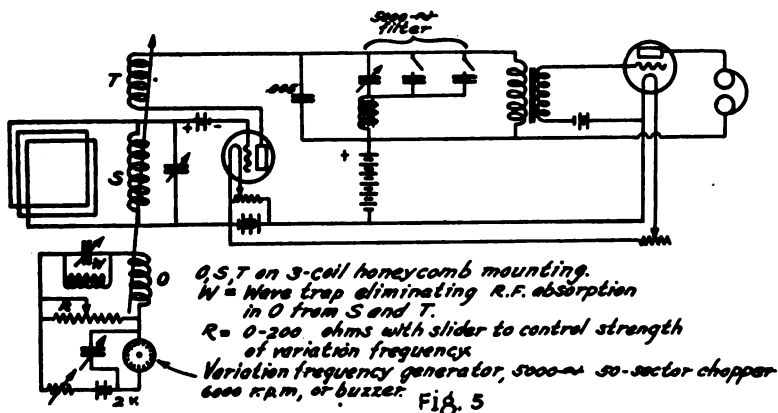


Fig. 5

The circuit of Fig. 3 is a one tube "flivver" circuit which has been given much publicity in newspaper radio columns. Nobody knows where it started. Nor why a filter should be necessary. It "works," as far as giving distinct evidence of the presence of the super effect is concerned, but it is extremely hard to control the variation-frequency generation by means of the coupling between the two big honeycombs, and, in common with all the one-tube circuits on which we have received reports, the amplification is not satisfactory until the variation frequency is reduced to well within audibility, necessitating a separate detector as in Fig. 1 of our July article. Then it works, but of course is no longer a one-tube circuit. For those interested in such circuits, Fig. 4, due to P. F. Godley, is of greater possibilities. The secondary S and its condenser are the regular closed circuit of a short-wave tuner, and the tickler

ation frequency itself is generated by a chopper or buzzer at the relatively low frequency of 5000 cycles, and introduced into the detector circuit electromagnetically. Try it some rainy afternoon.

One suggestion: keep a note book as you experiment with super-regeneration. Keep a record of the circuits you use, their constants, and the results experienced. It will come in handy.

More Daylight Transcons

What is your daylight range? Would you like to participate in the second A.R. R.L. Daylight Transcons on Thanksgiving Day, November 30th, and Sunday December 1st? If you have a good daylight transmitter and receiver and if you want to participate in these tests, get in touch with your Division Manager who is organizing daylight routes for the tests.

F.H.S.

Daylight Transcons Fail

By F. H. Schnell, Traffic Manager

THE first attempt at relaying a message across the United States during daylight failed. Nevertheless, the Divisions which handled the Transcon messages have gained much valuable information since it thereby became apparent that good "DX" work could be done during daylight, and new daylight routes are being established in these Divisions.

The eastern part of the country had considerable QRN and not as many stations were on the job as expected.

A brief summary of what happened is given for each days work.

July 2d

East-bound

*Hiram Percy Maxim
Hartford Conn*

*This is the pioneer of daylight success
Wise (6ZX)*

At 8:55 A.M. 6ZS OK'd for this message, while at 9:15 A.M. it was given to 6GR also. Feeling that everyone should have a whack at it, 6ZX then gave it to 6AWT at 9:35 A.M. Nothing further heard from this message.

West-bound:

*ARRL Transcon Nr 1
6JD Los Angeles*

*Greetings from east to west
Robinson (1CK)*

The route of this message was 1CK-1AZW-1AW-1VQ-2AWS-3DT where it died. When it reached Hartford 1ANQ picked it up and passed it along to 1AWB who gave it to 1AJP. From 1AJP it landed at 3DT for the second time but QRN prevented further relaying of it.

July 4th

East-bound:

*Hiram Percy Maxim
Hartford Conn*

*We look forward to a visit from you
Wise*

At 8:05 A.M. 6GR OK'd for this message. No further trace of it appears until we find 6IV picking up 6EA calling 6ZS. 6IV tried frantically to raise 6EA but without success. 6IV then phoned 6GT who got on the job and took the message from 6EA. It got no further.

West-bound:

The Maine message evidently failed to start. 1CPN got impatient waiting for it so started one himself which read as follows:

*6ZK Sunnyvale Calif
How is the weather there answer
Morse (1CPN)*

1CPN immediately pushed it to 1ANQ-1VQ-3DT-3CN where it landed at 10:35 A.M. While 1CPN was passing it to 1ANQ, 1AZW grabbed it off and 1AWB snatched it from him. 1AWB passed it to 2AWS and while this was going on 2TS took a shot at it and landed it OK. While 2AWS was giving it to 3CBK, 2TS was shooting it along to 3BG. 3ZO came to the rescue and picked it off from 2TS. 3ZO then gave it to 3AAY who landed it at 3JJ at 1:43 P.M. It died here, but there was just one scramble from start to finish as none of the fellows was going to let this one linger very long. It moved from Worcester, Mass., to Washington, D. C., (about 350 miles) in jig time. Some very classy relaying was done in handling this one and the whole gang was combing the ether for any kind of sign of it.

July 9th

East-bound:

*Hiram Percy Maxim
Hartford Conn*

*What will be next on the program
Wise*

This one started by "DX" phone from Sacramento. It landed at 6EN who gave it to 6AJH where it died as there was no possible chance of getting it out of San Ysidro during daylight. The next jump east is about 400 miles.

West-bound:

(from Lewiston, Me.)

*Elizabeth Spencer
Los Angeles Calif
Best regards from all your friends
Louis Plummer*

Clear routing is not available on this message. It seems it moved from 1FM to 1SC to 1CFI. At this point 1BKQ picked it up from 1BKR and OK'd for it at 12:06 P.M. From 1BKQ it moved through 1CHJ-2ANM-2BIG-2AWF, where it died. This one took an entirely different route and in the attempt to get it off by broadcast, 2AWF burned out his 50-watter.

We do not feel discouraged because no single message got all the way across. We did well under the circumstances, and much better than could have been done two years ago. The fellows in the central part of the country were somewhat disappointed because they had a half dozen routes all "greased" and they wanted a chance to show their speed.

We will have another chance at Daylight Transcons just as soon as the weather gets cold enough to keep the fellows indoors on Sundays.

Operating the Super-Regenerator*

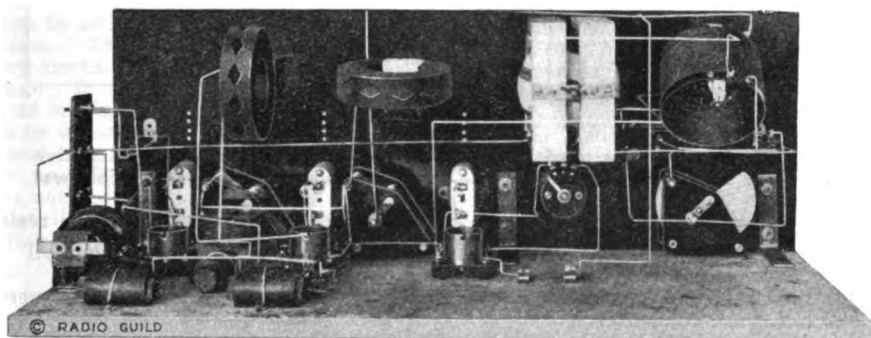
By Kenneth Harkness

IT has been our experience that there are a good many amateurs who, after a few experiments with super-regeneration, are inclined to doubt the veracity of Mr. E. H. Armstrong's contention for his new invention. We are afraid that there are a doubting few who harbor the belief that he concealed a three-stage power amplifier in that grip, in which—on the night of the demonstration at the Radio Club of America—he so carefully kept the loud speaker.

Another theory advanced by these experimenters for their failure to make their super-regenerators work is that perhaps Mr. Armstrong did not really give out all the dope—that he still has something up his sleeve about it.

regenerative receiver and two-stage amplifier. He did not have a power amplifier concealed in his hat or his suit case on either occasion. The results astounded everyone who heard them. We were present at both these meetings. The receivers were placed side by side. Each required three tubes and the same loop was used for an aerial in each case. The signals on the regenerative receiver and two-stage amplifier were scarcely audible a few away from the loud speaker. When the super-regenerative receiver was connected, the signals were tremendous—they filled the entire hall.

These same results are being obtained by others today who have built super-regenerative receivers in accordance with the in-



Both these ideas, in addition to being rather ridiculous, are of course quite false. Mr. Armstrong has nothing up his sleeve or stowed away in an old notebook which has not been revealed. He gave a complete explanation of the theory of super-regeneration in his address delivered to the Institute of Radio Engineers on June 7th. In that address he did not, of course, tell radio engineers how many turns of wire or what size of condensers were used to obtain the super-regenerative state. It would have been quite superfluous to volunteer such information at that time. The information he gave in that address, however, was quite sufficient to enable anyone to calculate the proper constants to be used in a super-regenerative circuit. Later, for the benefit of those who were frankly puzzled to know how to proceed in the application of the circuit, Mr. Armstrong at a meeting of the Radio Club of America gave all the proper values to be used to obtain results for different purposes. At both of these meetings he demonstrated his super-regenerative receiver as compared with an ordinary

receptions given by Mr. Armstrong. With a small loop, three tubes, about 200 volts of plate batteries and a loud speaker they receive the radiophone broadcast loudly and clearly. The cost of the apparatus, so far as the receiver is concerned, is about the same as an ordinary regenerative receiver.

There are some, however, who have failed to obtain any response from the receivers they have constructed and the reason for this failure to obtain proper results is often in the individual himself. It is not so terribly difficult to operate as some would have us believe. This is particularly true of the circuit shown in Fig. 1 but it must be remembered, however, that super-regeneration is an entirely new method of reception and the effects which apply to ordinary receivers do not necessarily apply to the super-regenerator. So the operator must familiarize himself with the conditions and learn by practice certain sounds which will indicate certain effects. We have learned to operate ordinary regenerative receivers in this manner. What we must remember is that a time existed when its successful operation seemed a con-

*Photographs by courtesy of Radio Guild, Inc., N. Y. City.

siderable achievement. We must approach the operation of the super-regenerative in the same manner, because the effects about which we learned concerning other circuits will only partially help us in the tuning of this new circuit.

The parts required for a super-regenerative receiver are enumerated in the legend of Fig. 1, which is the best of these circuits to use.

in the filter circuit. Final adjustments can be made by varying the capacities of the condenser in the filter circuit. The 5 mil-henry choke coil may consist of a D.L. 250 or 300 but it can be constructed by winding 210 turns of No. 28 S.C.C. wire on a form 5 inches in diameter. The length of the coil will be about $3\frac{1}{4}$ inches.

A suitable sized loop for the reception of 360 meters may be easily constructed on a

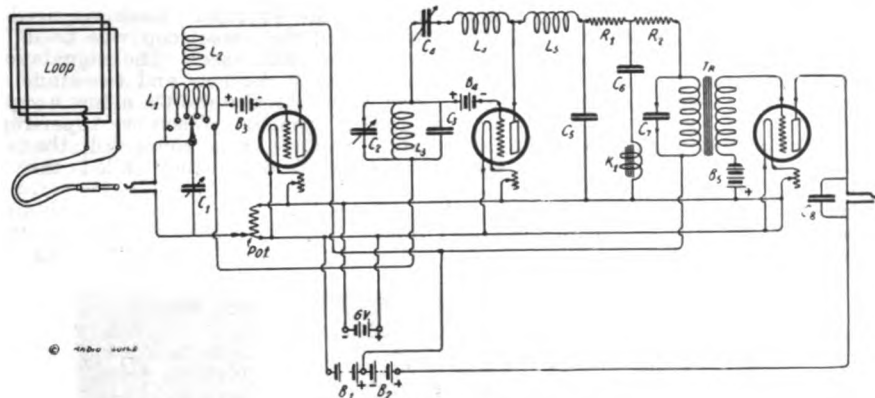


Figure 1

This circuit was used very successfully with the super-regenerative receiver illustrated in this article. The constants used were as follows:

- L-1 Stator of vario-coupler
- L-2 Varico-coupler with 100 turns on secondary
- C-1 .0005 m.f. variable condenser
- C-2 .001 m.f. variable condenser
- C-3 .002 m.f. fixed condenser
- L-3 D.L.-1250
- L-4 5 mil-henry inductance coil
- L-5 D.L.1500
- C-4 .001 m.f. variable condenser
- C-5 .005 m.f. fixed condenser
- C-6 .005 m.f. fixed condenser

- R-1 } 12,000 ohms non-inductive resistors
- R-2 }
- K-1 .1 henry iron-core choke coil
- C-7 .002 m.f. fixed condenser
- T-R Audio frequency transformer—high ratio
- C-8 .001 fixed condenser
- B-1 100 volt plate battery
- B-2 100 volt plate battery
- B-3 } Variable grid batteries
- B-4 }
- B-5 22½ volt grid battery

In the accompanying photographs one method of assembling this apparatus is shown. This arrangement was used with considerable success. It will be noted that the photographs show a variometer which is not indicated in the wiring diagram. This was used in the plate circuit of the first tube, to give a fine and simple control of the oscillation of this tube. This is not shown in the wiring diagram because, if the secondary of the varico-coupler is wound with 100 turns, the variometer is not required.

Most of the apparatus used in the super-regenerative receiver is quite familiar and its location will be recognized from the photographs.

Inquiries have been made concerning the choke coils and resistances in the filter circuit. These can now be purchased from radio dealers and it would be advisable to purchase the resistances. Almost any type of small iron-core choke coil can be used

frame 3-ft. square, by winding 7 turns of wire spaced about $\frac{1}{4}$ -inch apart.

Western Electric "E" tubes are the best tubes to employ in this circuit as the results obtained with "E" tubes are greatly superior to other types. 100 volts should be used on the plate of the first two tubes and 200 volts on the last one. This is obtained by placing two 100-volt plate batteries in series with a center tap, as indicated in Fig. 1.

The use of grid batteries is essential to the operation of this circuit. The values of the grid voltages vary considerably, but are usually in the neighborhood of from 10 to 15 volts for each of the first two tubes and 22 volts for the last tube.

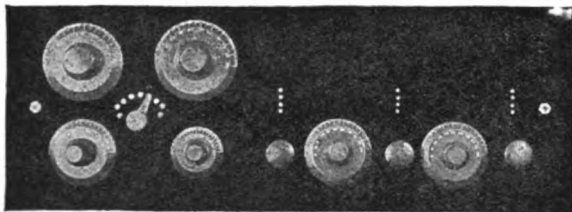
To operate this circuit certain effects should be sought which indicate that the circuit is functioning properly. Upon heating the filament a high-pitched whistle should be heard in the phones. This whistle indicates that the second tube is oscillating.

The feedback of the first tube should then be adjusted to obtain oscillation—which is indicated by the familiar click when the grid connections are touched and is accompanied by a loud roar in the phones. With both tubes oscillating a series of heterodynes should be heard if any of the variable elements in the circuit are moved. The circuit may be adjusted until this effect is obtained. It may be necessary to vary the grid batteries and the variable condensers to obtain these effects but unless these heterodynes of harmonics are heard the circuit is not correctly functioning. When the proper state has been obtained these heterodynes should be gradually tuned out. By

varying the condenser across the loop, voice and music from a transmitting station will become audible. The condensers C-2 and C-4 and the feedback coil L-2 should then be adjusted to obtain maximum amplification. The potentiometer will be found very useful in obtaining the critical grid voltage. It is not very difficult to find the point of maximum amplification without distortion or whistling, if these instructions are followed.

As far as DX work is concerned the writer has not had time to experiment much along these lines. This particular circuit is not suitable for C.W. reception. By this

we refer to straight C.W. telegraphy; this circuit will receive modulated C.W., of course. For straight C.W. reception it is better to use three separate tubes—one as regenerative amplifier, the second as oscillator and the third as detector. This is necessary because, with C.W. reception, the second tube must oscillate at a low audible frequency.



Excellent results on distance work have, however, been obtained with the reception of radiophones, using super-regenerative receivers constructed as shown in the photograph. Recently we received a letter from a gentleman in Philadelphia who constructed a receiver as described and who declared "We have very clearly heard Pittsburgh, Anacostia and Atlanta, Ga." We have also received other letters from all over the country indicating that radiophones are being received distances of 400 and 500 miles regularly with this design of receiver.

A Summer Test to Hawaii

ONE night in early July Station 1AW in Hartford was just about to call it a night and turn out the bulbs when an 8-station called and asked "QTC?" Mr. Maxim's west-bound hook was empty but the QRK was so good that he itched to send a message and so on the spur of the moment he cooked up one without ever writing it on paper:

Radio 6ZAC

Hawaii

Radio summer transpacific test

QSL if you get it

Maxim

Then he forgot the matter until the receipt of a letter from Cliff. Dow, 6ZAC himself, Wailuku, Maui, dated July 8th, advising that the previous nite at 7:44 he had grabbed off the message as 6EN, Duvall of Los Angeles, was sending it to KDU. Not only that, but 6ZAC copied 6EN's SVC one minute later: "Pse QSL by mail if tt msg is delivered tn-x-6EN."

This proves conclusively that a "test" is not necessary to keep communication open thru the summer if the stations on the coast will stay on the job. 6ZAC says that

all the C.W. stations are pounding thru just as QSA as ever but that he can rarely find anybody QRX-ing on 375 meters, which is his wave. 6KA and 6EN on the night in question were readable fifty feet from the fones on two steps and a pair of Baldies. If Dow had a Magnavox he could send their sigs back to them.

6ZAC now takes his work to California as a matter of course and this winter will be out for some distance. To this end the antenna system has been rebuilt and now consists of a 6-wire cage 90 ft. at the high end, coming obliquely down to a short mast near the house, and with two 4-wire cages 12 ft. apart as a counterpoise. All the great DX work of 6ZAC has been done on 3.5 amps from one 50-watt tube and the coming winter with two tubes and the new aerial should see some real reaching-out. Atlantic Coast amateurs beware!

There seems no question about 6ZAC's ability to hear what's sent to him even if he can't find anyone to listen to him. Perhaps the most remarkable thing about that summer message to Hawaii was how it got

(Concluded on page 32B)

The Greatest of All Amateurs

By Hiram Percy Maxim

I HAD the great good fortune the other evening to meet the greatest of all radio amateurs. The occasion was a memorable one. Through the courtesy of the Radio Corporation of America I and some fifty others sat down to dinner with him at the Ritz-Carlton Hotel in New York City. I had never seen him before. Few of us American amateurs had even seen him. The dinner was given in his honor. It was one of the most pleasant dinners I have ever attended, and every one of us A. R. R. L. people would have thoroughly enjoyed it could we all have been present. It would be a pity to allow such an event to pass down into history and not be recorded, and I am going to tell about it.

It seemed to me that most of the men who had distinguished themselves directly or indirectly in radio either were present or sent regrets that they could not attend. As I sat there and looked about and recognized the different famous men, I thought that there was probably more radio brains per square inch present than had ever gathered before. The toastmaster was Mr. Young, Chairman of the Board of the Radio Corporation. He arose after the dinner and said that he was not going to call upon any one who knew anything about radio. Unless he adhered to this rule he warned us that we would be there for a couple of days. He said it would bar him from calling upon Dr. Pupin of Columbia University, Mr. Alexander, Mr. Colpitts, Commander Hooper of the U.S. Navy, and fellows, he included Mr. Maxim, of the American Radio Relay League, and Mr. Paul Godley of the same organization. He referred to the American amateur as one

of the greatest forces in radio to-day, and put into actual words all of the things we have struggled so many years to accomplish. It certainly was a great pleasure to see that we American amateurs had been successful in getting over the fine things that we stand for. It proved that good Americanism, honorable dealing with our fellows, straightforward methods, dignity,

and good fellowship will win in the end every time. I glanced at "Paragon Paul" as Mr. Young paid the American amateur his compliments, and was deeply pleased to see the famous Godley smile slowly spread over the entire countenance. Our Paul caught the spirit of the thing, too.

Many national characters who might pass as not knowing anything about the technical side of radio spoke, although how Mr. Nally, president of the Radio Corporation, got by is open to suspicion, and his eloquent words of appreciation of what the Greatest of All Amateurs had done for humanity were tremendously impressive. Several speakers mentioned the personality of



—Photo by Kadel & Herbert

the guest of honor. It was worth special mention, for both Mr. Godley and I know what was meant. Overtopping all the wonderful work this fine gentleman has done in radio, stands his lovable and modest personality. Again it emphasized the queer fact that radio begets fine personalities. It seems to do something to a man to bring out the human side of him.

Presently the dinner and the speeches were over. Dr. Alfred Goldsmith was good enough to think of us and he secured an autographed dinner card and gave it to me. The little act was deeply appreciated, and I later gave the precious paper to Mr.

Warner, and it will hang upon the wall of The American Radio Relay League headquarters for many years, I hope. Then I had a few words with the Greatest of All Amateurs. I told him I wished I might convey to him the inspiration he had been to thousands of young Americans. His reply was characteristic of him. He said, *"And I wish, Mr. Maxim, I might convey to them the inspiration they have been to me!"*

There is your message, fellow American amateurs. It comes direct and first-handed from Guglielmo Marconi, a good fellow, animated by precisely the same thoughts and aspirations that animate us, a real dyed-in-the-wool brass pounder, a knight of the dot and dash, and the Greatest of All Amateurs.

[Editor's Note—Mr. Marconi in his address before a joint meeting of the A.I.E.E. and the I.R.E. told of many new developments of great interest to amateurs.

In England, he said, a large amount of investigation had been carried out in recent years on the efficiency of valve transmitting circuits and the radiation efficiency of aerial circuits, so that now it is possible to obtain in commercial work an efficiency from the anode input of the tubes to the aerial of seventy per cent, and an efficiency of radiation into space (of the antenna current) as high as fifty per cent; that is, an efficiency from the power input to the actual radiation into space of about thirty-five per cent; and this on waves as long as 20,000 meters, which have been notoriously inefficient as regards actual radiation. He did not disclose the methods used to secure this increase in efficiency but said that in short-wave stations it was hardly worth the extra expense involved, probably because of the natural greater radiation efficiency of the higher frequencies.

Tuned amplifiers, both radio and audio frequency, Mr. Marconi said were of the greatest technical interest. Quite amazing results could be had when the proper care was taken in the design of air-core h.f. transformers to keep electrostatic coupling between the windings to a minimum and to provide an impedance in the primary equal to the internal plate-to-filament resistance of the tube. The same idea is applicable to iron-core audio transformers, but an iron magnetic shunt is necessary between the windings to sufficiently loosen the coupling between the primary and secondary circuits.

Mr. Marconi has a fascination in the transmission effects to be encountered in Antipodal regions. The ease with which signals

can now be received on the opposite of the globe from the transmitter show there is something to the idea of the waves traveling around the earth by various routes and reuniting near the Antipodes. He told of recent scientific expeditions to points near the Antipodes of various high-powered stations, particularly an expedition to South America which made numerous observations on the signals of NPO, Cavite, on the other side of the globe. Received on a loop direction finder (unilateral) it was not particularly surprising to find that in such a location (within 2000 miles of the Antipodes) the constancy of direction was not maintained and the signals often would change direction, sometimes coming from a direction which indicated they preferred to travel a distance of 14,000 miles rather than come by the shortest route. Sometimes during the unstable periods when the direction was shifting the signals would arrive by two or more routes and, although steady and normal when received on the one-way loop, would interfere with each other when received on a simple vertical aerial in such a way as to produce slow beats resembling Morse letters transmitted very slowly!

Mr. Marconi then told of the very remarkable work done by Mr. C. S. Franklin, of the British Marconi Company, in phone operation on waves under 15 meters in length. Tube transmitters are used, with reflectors at both the transmitter and receiver. The reflectors provide about 200 times the energy that would be received without them, and seem completely to have eliminated fading, which might be expected to be so severe at such wave lengths as to make operation impossible. In order to take advantage of these benefits a very short wave must be used, as a reflector (particularly a revolving one) represents serious constructional difficulties for long waves. The lecture-room set demonstrated by Mr. Marconi used a wave length of one meter and was so extremely directional that a very small revolution of the reflector completely eliminated the signal at the receiver. The reflectors consist of a number of vertical conductors of a height of 1.5 wave lengths arranged on a cylindrical parabolic curve with the aerial in the focal line. A telephone circuit over 97 miles between London and Birmingham is providing good clear speech at all times on a wave length of 15 meters by virtue of such reflectors. The aerial itself in this case is somewhat over a half wave length long. The radiation efficiency at such small wave lengths is amazing high, about 300 watts being actually radiated into space from an anode input of 700 watts.—K.B.W.]

Some Good Dope on Mast Construction

By L. A. Bartholomew, 6LC

FELLOW radio bugs, did you ever look at an 80-foot mast made up of such material as 1" pipe or 2x2 and wonder by what trick it ever stayed up?

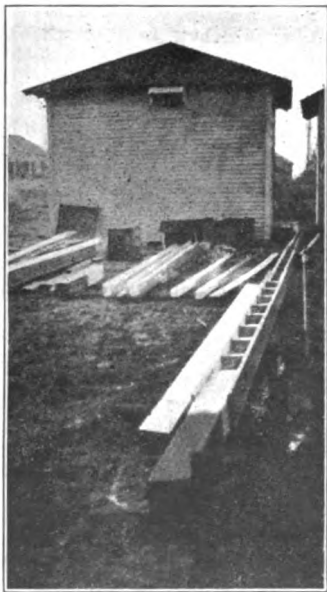
The writer has had a number of aeriels at different places, mostly in Michigan, and the rottenest luck was with the mast part. Ice and wind storms caused the worst trouble.

It was decided to put up some real masts that would stand in any weather. The photographs explain better than words how they are constructed. Altho the masts described are but 52 feet high, they are of such construction as will hold up a large aerial during the heaviest wind storms and can be safely climbed to the top should this be necessary, as for example, in putting a new rope thru the pulley.

Referring to Fig. 1, it will be seen that the inside of the mast is hollow, but of such construction as to make it very light and rigid. The mast is made up on the ground in sections, the sections progressive-

sections are slipped into each other, machine bolts are put thru each joint taking care that they go thru the blocks inside. Put in extra blocks at the joints for this purposes. $\frac{3}{4}$ " holes are drilled two-thirds of the way thru at every block, on alternate sides. This is to provide a place for $\frac{3}{4}$ " rods to be inserted for steps in case it is necessary to climb the mast after it is up.

The mast should be painted inside and outside with two coats of white lead. Red



ly smaller near the top so that each section fits inside the section below it. Three sides of a section are made first by nailing together two wide pieces and a narrow piece in the form of a trough. Use 8d. finishing nails, except at the joints, where No. 12 $1\frac{1}{2}$ " flathead wood screws should be used. Blocks $1\frac{1}{4}$ " thick are put inside of the mast 18" apart. When the



lead should be used on all metal parts that are not galvanized. Large size screw eyes are used for fastening the guy wires, and several turns of galvanized iron wire are wrapped around the mast thru the screw eyes which keep them from pulling out when under strain.

The outside dimensions of the sections as shown in the photographs are as follows: 7 in. x 7 in., $5\frac{1}{2}$ in. x $5\frac{1}{2}$ in., 4 in. x 4 in., and $2\frac{1}{2}$ in. x $2\frac{1}{2}$ in., the top section being a solid piece. The lap at the joints is 30" in each case except the top joint at which the lap is 24". A bottom piece made of red wood or cedar 5" square and 5' long was fastened inside of the bottom section so that $3\frac{1}{2}$ ' were left outside of the hollow part of the mast, but which set entirely in the ground when the mast was erected; in other words, the bottom piece

(Continued on page 32B)

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Carrying On

DID you read our July editorial entitled "Holding Our Own," O.M.? We want you to take it to heart. We telegraphing amateurs, in the performance of a useful work, are entitled to a share of the ether. In our effort to be fair to the newcomer and let him have his chance to listen to concerts, many of us have "bent over backwards" and seem afraid to touch the rubber. We want to emphasize that the broadcast listeners should be given a chance, and that every effort should be made to divide the hours in each community so that harmony may prevail, but we want to emphasize at the same time that such an arrangement means that we amateurs should retain a place in the ether for ourselves. The broadcast listeners should be helped to appreciate that we have some rights, too, and that after standing by the larger portion of the evening to give them quiet air we expect to be able to start up for the rest of the night without being called names.

Broadcasting is essentially a matter for the early evening hours, and likewise it is essentially a short-range proposition. We do not decry the interest a broadcast listener may have in endeavoring to get a phone station many hundreds of miles away in the late hours of night—in fact we're glad to see it because it is evidence of awakening amateur symptoms—but that is not ordinary broadcast reception. We have all kinds of QRM in our own work and the novice listener who tries for DX phones at all hours is an amateur with us—but nothing more. We should treat him as a brother-amateur—QRX when there's something special doing and play the game with him as a good fellow—but we are not going to permit it to be considered a crime to start up our message relaying at 10 o'clock or 10:30 after having been quiet up until then. In other words, he must play fair with us too. Fellows, this is a serious matter. There are many in our League who seem almost afraid to operate at any time of day or night, and this must not be. Our government counts us a big national asset and licenses us to operate. Let us hammer in the idea once more that we must always be considerate of the other fellow and remember that the newcomer

listener isn't on to the ropes and that therefore we must make due allowance for what he thinks are his rights, but for the sake of all that we hold dear **STAY ON THE JOB!**

K.B.W.

The Fall Reopening

HAVING just returned from our noon visit to the beanery around the corner and feeling somewhat super-regenerated, we venture to intimate that there is going to be considerable radio business this fall.

We amateurs had succeeded by last fall in pretty well eliminating talk of "radio seasons" in our work—we worked right thru the summer except in the southwestern states where admittedly it was a mighty discouraging effort. But the new crop of broadcast listeners do not bloom all the year around; most of them quit the game this summer and left the sweltering static-filled ether to us. Now they will be coming back, for September marks the weakening of O.M. Static and the laying of plans for winter activities.

Everyone seems to be counting on a big radio business, both from the returned novices of last season's crop (if they be hardy perennials) and several times that number of brand-new-comers. The summer slump, altho disastrous to many new dealers, has been of some benefit to the manufacturers: many of the wild-cat companies gave up the ghost and those that live thru until the fall revival will be the real ones, and the breathing spell was gratefully received by the legitimate manufacturers as an opportunity to reorganize manufacturing facilities.

But it seems certain that there is going to be a period of dullness for most manufacturers at the start of the new season. The shelves of most dealers are groaning under a miscellany of ill-chosen and awfully-constructed junk left from last season, and the warehouses of the jobbers are filled with the same kind of stuff, purchased at a stiff price when anything with the name of radio affixed to it was thot to be worth whatever its holder asked for it. Their capital is tied up in such apparatus and parts now, and even tho the manufacturers have reorganized and brought forth much

better products for the new season, the old stuff will have to move first. We're not talking about the old-established amateur houses now; we mean the thousands of unknowns who climbed on the band-wagon regardless of their lack of radio knowledge, eager to cash in on the novice broadcast boom. The jobbers are going to be compelled to move the junk they now have before they can buy new apparatus, and the dealers will have to get rid of it for them. Thank heaven we are not a poor uninformed novice listener!

K.B.W.

These Funny Numbers

SOMEHOW or other we managed to snaffle a four-day vacation last week.

Just before we left we inspected all the preparations for this issue of *QST* and decided that 128 pages was the proper number and by dint of much persuasion we induced our Advertising Department to print their forms first this month so that we could angle for the elusive bass in a nearby lake. When we returned we found much to our disgust that the energetic Advertising Department had roped in several more pages of advertising than had been counted on and darned if they hadn't encroached on our reading pages just that much; not only that, but they had gone ahead and printed the aft section of the magazine so that the page numbers couldn't be changed in accordance with our desire to increase the total number of pages. We wanted to do that, of course—you don't suppose we'd let that infamous business department crowd us against the front cover, do you? Not much!

But how to get around it was quite a problem, and we have had to adopt the expedient of lettered pages instead of numbered. So we've got eight extra reading pages inserted right here in the magazine. We hope nobody will object to the funny numbers.

K.B.W.

Clipping Coupons

A PUBLICITY man was in our office the other day and we were complaining about our inability to find a news-clipping service that met our needs. "Why don't you ask your members to send you clippings from their local papers?" he asked. And that settled the matter right there.

There are many reasons why it is desirable for our A.R.R.L. headquarters to have a comprehensive clipping service. It gives us a finger on the pulse of public sentiment in radio, it posts us on developments, often gives us the lead to a good article for *QST*, enables us to chronicle creditable amateur activities, and gives our headquarters office

a chance to safeguard amateur interests whenever anything incorrect or unjust is said about amateurs. At various times we have subscribed to many clipping services but they have loaded us with tons of "radio columns" and little or no amateur news, and even when they tried to confine themselves to things of amateur interest they were misled by the newspaper characterizations of broadcast listeners as "amateurs"—a commercial clipping service can't be expected to know the difference.

Right in our A.R.R.L. we have the makings of a clipping service that can't be touched—that can cover papers in every corner in the land and do so swiftly and efficiently. Will you do your part? It will be a big help to the headquarters office, particularly this fall when novice interest resumes with a bang. It won't be much trouble—try to get the habit, when you read a radio item of any sort in your paper, of taking out your pen-knife and clipping it out, pencilling on its rear the name of the paper, town and date, and periodically mailing your collections to us. Will you do this? Tnx, OM.

K.B.W.

A SUMMER RELAY TO HAWAII

(Concluded from page 29)

across the continent. At this writing we haven't heard but transcontinental relay traffic has been pretty badly "shot" this summer and yet this message got thru beautifully. Who handled it?

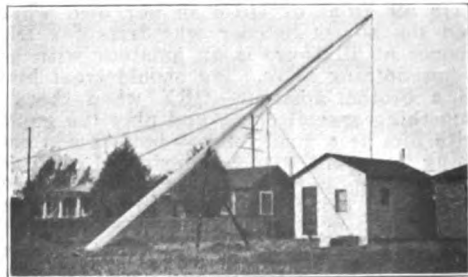
K.B.W.

DOPE ON MAST CONSTRUCTION

(Continued from page 32)

that sets in the ground is as large as the inside of the first section, as shown in Fig. 2.

A home-made windlass was constructed of scantling and pipe. Altho a crude affair, it served the purpose excellently. An idea



of raising the mast can be gained by referring to Fig. 3.

The material for one mast consists of the following materials. All dimensions are net. The pieces should be surfaced

(Concluded on page 41)

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



DEMON Static received the severest blow of his career during the month of July in the Roanoke Division. Just what he looks like can be determined by glancing at the cover of this month's QST. This picture was taken hurriedly as Demon Static was last seen heading for parts unknown and it is a safe bet that he will steer shy of the Roanoke Division for many moons or as long as that bountiful spirit of enthusiasm remains king among the good stations in that division.

St., Casper, Wyoming, has been appointed manager of the Rocky Mountain Division vice M. S. Andelin, resigned. There is a good deal of room for improvement in the Rocky Mountain Division and the rapid rise to the front of this division will be noticed under the capable guidance of 7ZO who is an old timer in amateur radio. Lend a hand, men, and bring your division to the top. It can be done.

A spark station cops first honors again. Come on C.W. and show some speed! Give the spark credit when it takes the honors.

Message Traffic Report By Divisions

JULY

DIVISION	Stns.	CW. Mega.	M.P.S.	Stns.	SPARK Mega.	M.P.S.	Stns.	TOTAL Mega.	M.P.S.
Atlantic	10	401	40	1	6	6	11	407	37
Central	18	597	33	13	793	61	31	1390	45
Dakota	8	153	19	6	66	11	14	219	16
Delta	1	11	11	0	0	0	1	11	11
East Gulf	3	24	8	5	150	30	8	174	23
Midwest	4	151	38	5	133	27	9	284	32
New England	16	650	41	10	482	48	26	1132	40
Northwestern	3	61	20	7	477	68	10	538	54
Ontario	3	72	24	0	0	0	3	72	24
Pacific	11	136	12	10	480	48	21	616	29
Roanoke	29	1092	37	7	86	12	36	1178	33
Rocky Mountain	5	140	28	1	12	12	6	152	25
Vancouver	2	16	8	4	55	14	6	71	12
West Gulf	13	340	26	30	693	23	43	1033	24
Total	126	3844	31	99	3433	34	225	7277	32

C.W. Messages, 3844—53%

Spark Messages, 3433—47%

Total Messages, 7277

It was a banner month for the entire division and the greatest number of messages ever handled was the result of this fine co-operation. What will it be in good weather? "F. B.," we say, and QTA next month.

Traffic has reached its lowest ebb, but this is not discouraging at this time of the year. We look for a decided pickup commencing with September and with our organization almost perfected we have a right to expect a tremendous increase of messages handled and with more speed in delivery.

Norman R. Hood (7ZO) 1022 South Ash

* B. B. BLISS, JR., 7OT *
* Boise, Idaho *
* Northwestern Division *
* 270 messages *

TRAFFIC REPORT

Atlantic Division—C.W.: 3ZO, 208; 3ANJ, 46; 8CEJ, 39; 8AMM, 26; 3FS, 23; 3WV, 15; 8NB, 14; 8AMQ, 11; 8CJH, 10; 3ANO, 9; total 401. Spark: 8TC, 6.
Central Division—9AIU, 19; 9CP, 30; 8ZAG, 43; 8AM, 7; 8AND, 7; 8CAZ, 47; 8ZZ, 52; 9DDY, 56; 9BJR, 27; 8AQZ, 47;

8CMI, 23; 8BVR, 80; 8AZH, 16; 8FT, 2; 8ZH, 19; 8BKO, 13; 8TJ, 5; 9CBA, 104; total 597. Spark: 9ME, 145; 9CP, 26; 9ZN, 110; 8AGT, 15; 8AHY, 44; 8AZH, 4; 8CWC, 4; 8FT, 94; 8CLD, 39; 8UC, 63; 8AIZ, 49; 8ZO, 192; 8TJ, 8; total 793.

Dakota Division—Twin Cities, 69; 9BBF, 15; 9YAJ, 17; 9BAF, 13; 9BAV, 4; 9AOR, 13; 9GW, 2; 9CDV, 2; 9ASF, 18; total 153. Spark: 9ZC, 6; 9FX, 5; 9BRI, 18; 9BOF, 10; 9AVZ, 15; 9AIF, 12; total 66.

Delta Division—C.W.: 5DA, 11.

East Gulf—C.W.: 4KF, 19; 4HZ, 3; 4DL, 2; total 24. Spark: 4BI, 60; 4HS, 50; 4GM, 8; 4EZ, 29; 4DZ, 3; total 150.

Midwest Division—C.W.: 9BSG, 79; 9BZI, 20; 9BGH, 20; 9AMU, 12; total 131. Spark: 9JA, 54; 9DRA, 17; 9FK, 44; 9ARZ, 15; 9ARA, 3; total 133.

New England—C.W.: 1AGH, 42; 1ANQ, 50; 1AWB, 130; 1AYU, 28; 1ASF, 30; 1BAS, 32; 1BGF, 8; 1BKQ, 113; 1BQK, 16; 1CDO, 25; 1CK, 32; 1COT, 18; 1HX, 46; 1IV, 44; 1OZ, 30; 1QP, 6; total 650. Spark: 1ACO, 12; 1AYU, 116; 1BJS, 28; 1BRQ, 41; 1CK, 16; 1DY, 112; 1FM, 84; 1LZ, 21; 1SC, 30; 1WQ, 22; total 482.

Northwestern Division—C.W.: 7SC, 37; 7QE, 19; 7LR, 5; total 61. Spark: 7OT, 270; 7BK, 125; 7NW, 27; 7MF, 18; 7BG, 14; 7IW, 14; 7KJ, 9; total 477.

Ontario Division—C.W.: 3JI, 26; 3JK, 9; 9AL, 37; total, 72.

Pacific Division—C.W.: 6ZB, 1; 6AHF, 8; 6AJH, 8; 6AVR, 8; 6FH, 20; 6GF, 37; 6LV, 14; 6ZX, 11; 6AS, 10; 6ASJ, 12; total 129. Spark: 6EC, 8; 6TW, 2; 6ZB, 5; 6FH, 7; 6GR, 212; 6ABX, 9; 6VK, 72; 6AS, 70; 6TC, 2; 6CC, 93; total 480.

Roanoke Division—C.W.: 3ZZ, 115; 3IW, 107; 3BLF, 103; 3MK, 42; 3BIJ, 40; 3TJ, 20; 3BMN, 16; 3ACZ, 10; 3BNE, 10; 3ATZ, 5; 3HL, 3; 3AUU, 8; 3BZ, 31; 3AEV, 11; 4GX, 9; 4DC, 10; 4ID, 21; 4MW, 121; 4DS, 41; 4GH, 71; 4LP, 10; 4DQ, 27; 4BX, 95; 4KC, 48; 8BDB, 42; 8AMD, 30; 8SP, 26; 8CHO, 8; 8CAY, 12; total 1092. Spark: 3AOV, 1; 3ACK, 8; 3BVC, 20; 4IE, 32; 4MF, 12; 8WD, 8; 8BAZ, 5; total 86.

Rocky Mt. Division—C.W.: 9AMB, 80; 9DTE, 20; 9DHI, 15; 7LU, 15; 7ZO, 10; total 140. Spark: 7ZV, 12.

Vancouver Division—C.W.: 5BQ, 11; 5CT, 5; total 16. Spark: 9BD, 32; 5DO, 5; 3EC, 10; 5CZ, 8; total 55.

West Gulf Division—C.W.: 5NS, 56; 5VA, 42; 5JL, 24; 5IR, 25; 5QS, 55; 5ZAY, 31; WTK, 17; WRR, 47; 5ZAT, 25; 5ZG, 7; 5AE, 5; 5BA, 3; 5ZX, 3; total 340. Spark: 5OI, 11; 5UD, 3; 5DY, 13; 5AL, 2; 5TU, 83; 5IC, 15; 5MK, 12; 5TP, 67; 5NS, 20; 5TC, 19; 5QU, 15; 5AG, 6; 5PE, 76; 5ZAF, 46; 5IR, 110; 5ACQ, 9; 5AEJ, 13; 5QI, 27; 5PI, 14; 5WA, 42; 5ZAW, 3; 5ZC, 15; 5ZAE, 15; 5ACU, 10; 5ZAN, 10; 5HC, 10; 5KN, 16; 5OC, 4; 5PZ, 1; 5XAD, 6; total 693.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

The reports received by the Division Manager this month are still meagre due to the fact that up to the 15th of July the re-organization had not been completed. This condition will soon change as new appointments of traffic officers are made, but it will take a little time yet to get matters working smoothly.

The Division Manager is gratified to find that some of the League have had enough "pep" to respond to the call which he made in last month's report for volunteers to fill vacancies in the traffic organization. Remember, fellows, it is up to you to come forward and do your part; the work of the Division cannot be carried on by the Division Manager alone. There are plenty of cities that have not yet been heard from where City Managers are to be appointed. As stated in last month's report, it will, of course, be impossible to give an appointment at present to all who may offer their services, but we will at least have the advantage of having the names on file of those who are willing to help to aid us in filling future vacancies, as there are changes continually taking place, due to one cause or another.

The Traffic Manager has called the attention of the Division Manager to the fact that he has received some complaints regarding the absence of message and other traffic reports for this Division. In most cases the trouble has been due to individual stations for not sending in their reports. It has been noted that some of the excuses made for not sending reports have been that it was not known to whom to send the reports, but as the name and address of the Division Manager appears in a prominent place in the front part of QST, he does not think that such excuses are valid. Instead of criticisms, it would be much better for those who are making the criticisms to do something of a constructive nature.

Frederick B. Ostman (2OM), 180 Broad street, Ridgewood, N. J., has been given the appointment as Executive Assistant for the Northern Section; and Edward B. Duvall (3EM), 3909 Cottage Avenue, Baltimore, Md. as Executive Assistant for the Southern Section.

James F. Rau, (3FM), 2085 E. Kingston Street, Philadelphia, has been appointed Assistant Division manager for the Eastern Pennsylvania District. Other appointments of District Superintendents and City Managers have been made, and if sufficient space is allotted in QST, a complete directory of appointments in each State will be given in the next issue, including addresses and the territory covered by each. If space is not available it may be possible to give one

or two States at a time until all are published.

As a guide to the future with regard to sending reports—if you do not know who your Dist. Supt. or City Mgr. is—send your reports to the Executive Assistant for the section in which you are located. If you are located in New York or New Jersey they should go to Mr. Ostman; if you are in Pennsylvania, Delaware, Maryland or the Dist. of Columbia send them to Mr. Duvall. The Executive Assistant will then advise you to whom your future reports should be sent.

3QV, 3BJY, 3BG are DX men but nil reports. 3ADX is doing mighty fine work and frequently on the job but no report.

In District No. 6 (Penn.) the summer weather is responsible for the general lull in this district, the fone craze is about over and the fellows are looking over their sets for the coming DX season. 8HR has no definite plans for the winter but expects to install C.W. (Eventually they all will do that.—ADM.) 8XN expects to do a little DX on their 2 K.W. spark but the main trouble is getting ops to work the set. 8PQ is going to junk the spk and take a chance at C.W. (Not necessary to take a chance it's sure fire stuff.) The D.S., 8BQ has fine intentions of installing 300 watts of C.W. (Let's hope his intentions materialize.) 8DT is talking about C.W. (Don't talk abt it, use it.)

What we want at this time is some "pep," less criticism, and more real co-operation, and we will soon get the affairs of the Division in good shape for the active season which will soon be upon us. If you want any appointment either as a traffic officer or as an official relay station write to the Executive Assistant in charge of your Section, and he will give the matter his attention and let you know what he is able to do. He cannot recommend the appointment of everyone who applies, but he will have your name on file from which he can fill future vacancies.

CENTRAL DIVISION R. H. G. Mathews., Mgr.

During July a general pickup in traffic has been reported throughout the division, although this increase is not shown in the number of messages reported.

ILLINOIS: Mr. Klaus has been relieved and Mr. N. Cutright Smith, 9AIH, of Hoopeston, Ill. appointed Assistant Division Manager for Illinois. Mr. Smith is busy reorganizing his State, the tentative organization being as follows:—

Illinois has been divided into four districts, this division being made by drawing a north and south line through Rockford and East and West line connecting Quincy and Danville. The section at the upper left hand corner of the State after this division

is made is No. 1. Mr. Burke, 9NQ of Galesburg, being District Superintendent. The upper right hand section is district No. 2 with Mr. Bergman of 9CA, Dwight, Ill., as District Superintendent. The lower left-hand section is numbered district No.3, the District Superintendent being Mr. Cain, 9MC of Roodhouse. The remaining section, the lower right hand one, is No. 4 with Mr. Nash of 9UK as District Superintendent.

OHIO: Interest in relay work is on the mend and getting new inspiration since the new organization has become fairly well started in lining up stations. The District Superintendents are getting in touch with the various stations in their respective districts. More co-operation is wanted on the part of the individual stations in sending in reports of the traffic handled. Come on fellows. Let the rest of the gang know what you are doing at your station. Your District Superintendent cannot report your work unless you let him know what you have been doing.

The following City Managers have been appointed: Painesville, John D. Bay, 8TT; Canton, Henry L. Ley, 8ZV; Dayton, Edward P. Getter, 8AIM. Relay stations and Radio Clubs in these cities are asked to give their city Managers all the support and co-operation possible. These men will appreciate you help in reporting bits of live, interesting radio news and the activities of your clubs.

Cincinnati, Dayton and Columbus stations are doing good work in spite of the QRN and the wind and electrical storms that have been a menace to aerials in several sections of the state. 8AIM is being remodeled and repanelled, 8FT is out of commission due to a burned out secondary, and 8ARS is closed for the summer.

A spark coil station has been erected at the camp of the Middletown boy scouts and is going in good shape. The camp works the distance of over 18 miles with 8AHY on daily schedule and handles from one to three messages daily. This is the only convenient means of communication for the camp and has therefore proved valuable.

INDIANA: The fellows are beginning to take more active interest in their work. Most of the traffic is going thru by spark since some of the fellows who had C.W. stations in operation have reinstalled their spark transmitters as being more reliable.

District No. 1. 9ME, 9AKD and 9FS were the only ones on the job. The other stations reported no traffic. Mishawaka has one station, C.W. with the call letters 9DNJ.

District No. 2. Only one report was received this month which was from 9AIU. 9AIU has no difficulty in working stations over 125 miles in daylight which proves a great help in handling traffic. QRM has been so bad lately that there is no hope of

hearing any stations excepting locals. 9CP has been on the air and has been able to work DX with spark better than with C.W. Two new stations have popped up in the district that are in fine places to help with traffic. They are 9DEK, at North Judson, and 9BLC, at Lafayette. Both are C.W. stations and are doing good work.

DAKOTA DIVISION N. H. Jensen, Mgr.

Traffic may be light, but most encouraging reports are coming from all over the Division about the preparations being made for work this fall and winter.

SOUTHERN MINNESOTA: 9DR is doing fine work with 100 watts. Has worked 16 states. City Manager Carpenter of Minneapolis will have station 9DX going very soon. 9APW had a serious fire at his home and lost all of his apparatus. Several of the regular routes are being kept open and traffic is moving in small quantities. 9YAJ is doing experimental work in the laboratory at St. Olaf's College this summer. He has been engaged as an Instructor in Physics for the coming year in that school. A 2000 volt 1500 watt motor-generator has been ordered for 9YAJ. 9BKP is on the air regularly with both C.W. and spark. Fellows, if you want to see a real station, and an up-to-date antenna system, go over to New Ulm and give 9BBF the once-over.

NORTHERN MINNESOTA: 9BAV reports that he will clear with 9AUA every night at 9:30 whenever atmospheric conditions permit. 9AOR will be on every Monday, Wednesday and Friday nights from 10 P.M. to midnight. 9CDV should prove a good station for east and west traffic. He is now frequently in communication with Twin City stations and also with 9YF and 9AUU.

NORTH DAKOTA: 9BZF of Jamestown is installing a 20 watt C.W. transmitting outfit. 9AUU and 9BFQ are doing very good work locally. With many new C.W. stations going in this summer, the prospects are excellent for handling a great amount of traffic thru North Dakota as soon as QRN drops off somewhat.

SOUTH DAKOTA: 9YAK and 9AYW in the southern part of the State are on occasionally. 9BRI is doing good work, as also are 9ASF at Aberdeen and 9AVZ at Pierre. 9BOF at Salem is making improvements in his station.

DELTA DIVISION John M. Clayton, Mgr.

The Delta Division is being reorganized entirely. Mr. Hubert E. deBen, 5ZAU, of New Orleans has been appointed Executive Assistant and will be in charge of reports and will be chief adviser to the Division Manager. Mr. Halph Pemberton, 5WF, of

Scott, Arkansas has been appointed Assistant Division Manager for the state of Arkansas; Mr. W. C. Hutcheson, 5DA, of Wind Rock, Tenn. has been appointed Assistant Division Manager for Tennessee; Joe A. Pullen of the famous 5ZAB at Houma, La. has been appointed Assistant Division Manager for Louisiana. To date no appointments as District Superintendent have been made in any of the Districts in the Division. However, we will have completed our Division organization by next month. All members who are engaged in active relay work should get in touch immediately with their Assistant Division Manager and secure an appointment as an Official Relay Station. No City Managers have been appointed under the new organization.

Relay work increased considerably during the past month. This is a rather unusual occurrence for this part of the year. The recent slump in the broadcasting outfits, has no doubt, a lot to do with this state of affairs.

ARKANSAS: 5JD, Kinsolving, has resigned as District Superintendent for the State. Not much traffic moving thru the state now. However 5JF, 5CB, 5XAC, 5ABY, 5ZAZ (ex 501), 5WF and 5RO are on the air occasionally. 5CR at Little Rock will be on shortly with the spark set and a small C.W. set. 5ZAZ at Fayetteville is rebuilding the station and will have his record buster 20 watt C.W. back in operation. 5DQ going OK now and then.

LOUISIANA: Relay activities are increasing. 5ZAB is being remodelled on elaborate scale which will result in it being a much better and bigger station with remote control for spark and 20 watt C.W. 5ABA has recently opened up with 10 watts C.W. and is tearing things asunder out his way. 5ZAP and 5UK have been demonstrating their prowess and will doubtless prove to be invaluable stations next fall.

MISSISSIPPI: 5YE has been operating on irregular schedule due to heavy QRN which has invaded his part of the globe. 5ZAU, no other than ex-5ZP of Nola, now at Bay St. Louis, Miss. will be ready for operation in a very short time.

TENNESSEE: Relay activities rather light in this state. A report was received from only one City Manager. Activity in Knoxville is still very slow. The fellows would rather listen to broadcasting and go swimming than relay messages. Station 5RE is now operating with one 5 watt tube and seems to be kicking up some racket but has relayed only a few messages. 5WO has his 15 watt set ready for action but is doing very little work. (Probably waiting for broadcasting to let up) 5WS, the City Manager of Knoxville, is very quiet but will be going full force this fall. 5DO, Memphis, reports his station in operation

and handled quite a few messages during the month. (Excellent spirit DO, keep it up.) Mr. Hutcheson, A.D.M., 5DA of Wind Rock has been away during the month and consequently was unable to operate the set. He handled 11 msgs. during the short time he was on, however. (Good work Hutch—may your tribe increase.)

EAST GULF DIVISION B. W. Benning, Mgr.

FLORIDA: Jacksonville: District Supt. M. D. Clark reports that in spite of summer weather the gang is keeping up its interest and new stations are being put into shape for real work this fall. 4HZ with 10 watts of C.W. has made his debut into the DX game and is now going strong. 4EZ has replaced his half KW spark with a full KW and has increased his range accordingly. 4EZ to 4FD continues to be the ONE reliable short jump relay that works thru all weather; and practically all of Florida messages are handled over this route at present.

Louis Bookwalter reports there are two real stations in West Palm Beach, 4DZ, spark and 4DL, C.W. 4DL is reaching out practically every night and reports working a few stations in the second, third, fourth and fifth districts. This, along with the DX done by 4DZ on spark, is a real accomplishment for stations located as far south in Florida as they are.

GEORGIA: 4FD and 4GN have been tearing off traffic by the armful. 4GL has been on a few nights but outside of this we have no dope from Atlanta. Atlanta fellows failed to report on time and it is only by hard work on our part that we are able to report the following. 4BI, 4GM, 4HS and 4KF are the only stations in Atlanta that are doing any work at present in the relay line. 4BI spark and 4KF C.W. are doing the best work. These two stations are doing relay work with the same ease that is expected in winter weather. 4HS and 4GM sparks are also doing nice work.

ALABAMA: !!! Mac has come across with a letter giving us some dope on Alabama. 5XA has been closed down all summer undergoing repairs, removal, remodeling and much new equipment added. 5XA will undoubtedly be one of the best equipped amateur stations in the south next year and we will be able to handle all sorts of traffic (HOT DOG!—B.W.B.)

Just one parting word or two, fellows. You probably noticed the blank space that was the report of the East Gulf for last month. We won't try to make any alibi about it but will just say this: IF YOU EXPECT REPRESENTATION IN QST YOU WILL HAVE TO GET YOUR REPORTS IN ATLANTA BY THE 28th OF THE MONTH.

ALASKAN DIVISION Roy Anderson, Mgr.

The writer made a journey to Hyder this month and found another radio enthusiast in the form of E. L. Dale, of the radio service at that place. 7IT is experimenting with burnt out bulbs and worn out storage batteries. His persistency will one day yield him a lifelong membership in the Morningside Sanatorium. Several new members decorate the A.R.R.L. Alaskan membership list, but these new fellows are unusually quiet, considering that they are supposed to be *wireless amateurs*.

MIDWEST DIVISION L. A. Benson, Mgr.

IOWA: July was marked by a number of severe lightning storms which made it quite impossible to handle a great amount of traffic. 9BSG did good work in pushing messages thru Des Moines and 9FK managed to hold Clinton open, using both spark and C.W. 9BGH with 5 watts and 9BZ with 10 watts keep pumping thru the Q. 9DRA on spark and 9AMU on C.W. are heard again. 9AEQ is cutting thru fine on both spark and C.W. and offers a route to Omaha. A good station is needed at Sioux City to connect with 9BGH.

NEBRASKA: 9HG, 9DPB, and 9HT have been sticking it out. 9DQE pounds thru on his C.W. of low power. The broadcasting is dying away and amateur operation is being resumed. 9WI continues to move traffic. Lou Chancky has been appointed Route Manager, and R. J. Rockwell has been appointed District Superintendent.

NEW ENGLAND DIVISION P. F. Robinson, Mgr.

Traffic has shown a decrease for the past month but a large number of stations stick on the job in spite of QRN and hot weather. 1BGF has been reported in every district which is something unusual for a station on the Atlantic coast.

1ANQ is back on the air again after a long lay-off. 1BM has taken up C.W. 1QP has tried out 23 new designs of antenna in the hope of finding a better radiator for C.W. 1SC continues his good work on both spark and C.W. 1ASF spends his time trying to make the super-regenerator work. (Let us know how you come out, OM.—T.M.) McShane at 1BRQ keeps the gang up in Maine on the job. From 1BDV to 1VT stations pound away nightly. QRN does not seem to bother them at all. "LW" of 1DY has everything running smoothly, but "LN" is seldom heard. 'Smatter OM, is there a lady in the case? 1CK is experimenting with a 5 watt tube set, and keeps the old spark on the job for traffic work.

NORTHWESTERN DIVISION**H. F. Mason, Mgr.**

Re-organization of this division is nearly completed. During the summer lull in relay work, the division officers are lining things up in a manner that will bring big results when winter comes. If you haven't received your official relay appointment yet, or haven't been reporting messages handled, please get in touch with the Asst. Mgr. in charge of your State without delay. They are:

Montana: H. E. Cutting, Box 517, Bozeman, Montana.

Idaho: B. B. Bliss, Jr., 417 Bannock Street, Boise, Idaho.

Oregon: Royal Mumford, Rt. #1, Box 15-A, Vancouver, Washington.

Washington: K. W. Weingarten, 3219 North 24th Street, Tacoma, Wash.

These men are out to improve relay work, by lining up relay activities in their respective States. Do your part to improve relay work, by reporting activities and traffic handled to them.

At present, heavy static prevents the handling of much traffic in the eastern and central parts of the division, but along the coast, its effect is not near so pronounced upon relay work. There are many low powered C.W. stations on the air throughout the division, and if you spark fellows will only tune for them, and give them your traffic when the QSS is bad, you'll find that they will put it through for you. (Righto!—T.M.)

MONTANA: Practically no traffic is being handled on account of QRN, and many stations are off the job for this reason. Accordingly, the A.D.M. is too busy going after new Dist. Supts. to try to make up a report for this month. 7ZU at Billings is doing his darndest to keep the Northern Route east open all summer, but there just isn't anyone on with whom he can handle traffic consistently in either direction. He is using both spark and C.W.

IDAHO: There are quite a few stations on the air, but impossible to do anything outside of local work, owing to the intense QRN. 7AEM, and 7OK are two new stations in Boise, who are alternating with 7YA and 7OT. 7WG and 7JF in the northern part of the state are also locked up by QRN, but are heard at times. Mr. Bliss, A.D.M., is to be congratulated on the progress he is making towards getting his state in readiness for the coming relay season.

OREGON: With static, broadcasting, and vacations, there is mostly NIL for a reports from this State this month. However, 7NA, 7TO, and 7VF of Portland deserve mention for their consistent work in the face of adverse conditions. 7IW, D.S. at Eugene, is the only station handling

traffic in his city. The rest are all rebuilding and putting in C.W.

WASHINGTON: Eastern District. L. C. Maybee, D.S. at Pasco, reports traffic moving west with good regularity, but eastern traffic is moved with much difficulty. 7GE was QSO with 7AAB at Billings, Mont., when F. S. from 9ZN was operating there, during his vacation trip, but owing to 7AAB's QRS with the code, it is impossible to get anything through now. 7TH in Walla Walla has a ten watt C.W. set, and is anxious to help out by QSRing east-bound traffic. At Spokane, 7QW, 7NL, and 7OF are worked OK from Seattle, but bad QSS is experienced in working them from Pasco. Also, these Spokane stations have great difficulty in passing traffic to stations further east.

Grays Harbor District: Walt Hemrich, D.S. reports everything OK in his district. Traffic for the south or east may be routed thru Grays Harbor stations with the assurance that it will be promptly forwarded. C.W. is playing an important part here. One is on every night, and they can't get enough traffic to satisfy them. 7KJ, 7NW, and 7SC are handling the bulk of the traffic.

Tacoma District: Wm. Motz, 7QE has recently been appointed D.S., and states that 7BG, 7QE and 7AW are handling some relay traffic, but that much unnecessary local work during relay hours interferes to quite an extent. A number of new stations have been installed.

Seattle District: Mr. Kinsey, 7PO, having gone to sea again, a report from this city is totally lacking this month.

ONTARIO DIVISION**A. H. K. Russel, Mgr.**

Owing to the D.M. taking a holiday a little early in the month, this report only can take in the information of the Toronto district.

Toronto continues to be converted into a C.W. hive and there is a new one to be heard nearly every night now, though most of them haven't got busy on the DX work yet. The latest converts to C.W. are 3GE and 3FO. The spark will be kept in the case of 3GE as a standby. 3CZ has been practically out of business in the relay line, due to his taking over the post of engineer of the broadcasting plant at C.F.C.A. 3JI and 3JK to which is now added 3FC, all keep Toronto on the map. 9AL also has been on the air a little more than usual, due to his wife having gone to the country on a vacation.

PACIFIC DIVISION**J. V. Wise, Mgr.**

Due to the vacation season very few reports have been received; districts that reported are as follows:

Dist. B—Our old friend, 6FK, of San

Diego, has been forced to resign as District Superintendent as his time is taken up with other things. Mr. L. Picker, 6AJH, San Ysidro, succeeds him. With the summer QRM and the ARC QRM to battle very little DX work has been done, and few messages handled. The following stations handled traffic for the district, C.W. 6EC, 6TW, 6ZB; Spark—6AHF, 6ZB, 6AJH and 6AVR. 6GT and 6IV a little further north, deserve special mention for their aid in getting traffic through.

Dist. G—6EX, 6VK, 6HP, 6ZI, 6AQU and 6ZAF are handling the larger amount of traffic to and from Oakland. 6ZI and 6ZAF are still working 6ZAC, showing the merits of C.W. during the static season. Stations north and south are easily worked direct regardless of static.

Dist. H—6GR spark carries away the honors of both the division and the district with 212 messages to his credit. Almost a continuous watch is kept at this station as two operators are on the job. 6GF and 6FH are breaking through in nice style on C.W. The one peculiar thing is the fact that few sevens have been heard here since the middle of May. Getting traffic north has been hard work as well as very slow.

Dist. J—All stations in this district have closed for the remainder of the summer. 6AJR will be on again with a 50 watt C.W. plant.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Last month we promised Schnell 1000 msgs. this time. And we went ourselves one better with 1178. A little team work and a traffic report from nearly everyone did the trick. Fellows, your Division Manager is proud of you and congratulates every man. Here is how it was done.

NORTH CAROLINA put it over with a rush this month. The splendid spirit evidenced throughout the State makes us feel good all over. Several of the fellows were so doggone anxious to get the maximum number of msgs. that they wired in the dope at the last minute. That's the real spirit.

First District: 4GX and 4DC are doing all the work in this section since all the Winston-Salem bunch is quiet now due to rebuilding and moving stations. This district, formerly the most active in the state, will push forward with 4EN and 4CX back in the game. 4GX and 4DC, both in Greensboro, have been reported in Lewisburg, W. Va., in daylight by 8AMD which is very fine work indeed. The majority of the msgs. handled by these two stations have been in daylight.

Second District: 4MW, 4GH, 4DS, 4IE, 4KC, and 4LP are all going strong in this district as the traffic report shows. 4MW

is the Boiled Owl of the lot. 4KC has been away most of the month but comes forward at the last moment with a traffic report. 4GH, who rambles all over N. C. and keeps well in touch with everyone, reports unprecedented activity and enthusiasm all over his district, and the state. 4IE is a big aid on spark during the summer. 4DS and 4LP are both reaching out and handling traffic regularly.

Third District: 4ID is doing all the relay work done in his district. Don't let one man do it all, fellows. You Charlotte fellows forget that broadcast stuff and come back into the fold, we need your help.

Fourth District: 4MF is reaching out on spark.

4EA has given up spark for C.W. (Had to in order to prevent Civil War in New Bern, HI!) A 20 watt C.W. will soon blossom forth.

4BX is with us strong now on C.W. He is clearing all points north and south, maintaining schedules both ways, boasts two operators and is a real relay station.

WEST VIRGINIA seems to be the only state in the division that has not fully recovered from the usual summer sickness.

8AMD heard all of the following and worked a good many of them in daylight: 3BZ, 4DC, 4GX, 3AEV, 8CAY, 8SP, 8CHO, 8AVW, 8BDB and 3BLF. He seems to have done the best daylight work of anyone in the division, having worked both 3BZ and 8AEV at Danville, an unheard of thing before.

In the Fifth District, 8BDB is by far the most active station and is clearing stuff in great shape as the traffic report shows. 8SP has improved the 100-watt C.W. set and is going strong. 8AFD is now QSA everywhere with straight and I.C.W. 8WD is rebuilding and has one 80 foot stick up in the air. He and 8BAZ are the two spark men in the state. 8CHO, on 10 watts of C.W., is doing far better work than he ever did on spark. 8CAY is heard sometimes and on the 4th of July logged stations as far west as Canton, O. in daylight. He was also heard in Danville, Va. in daylight.

VIRGINIA: The outstanding features of the month's work in the Old Dominion are the extraordinarily large number of msgs. handled and the opening up of reliable daylight work between Norfolk and Richmond. The daylight transcons are chiefly responsible for bringing about the latter condition. Some of the stations working surprised themselves.

First District: Portsmouth and Norfolk are staging a grand comeback. On July 14th extensive tests were held at NAM to eliminate interference on short waves and some very interesting results obtained. Local A.R.R.L. men assisted in making audibility readings. A filter system now used promises to almost eliminate the mush.

July 4th seems to have been a red letter day for the gang and communication was had with Richmond in daylight; something new in this section. 3BNE, 3ACK, 3MK, 3BVC, 3ACZ, and 3ZZ were able to work and handle traffic with the Capitol and a Sunday schedule has been arranged with 3BLF, 3TJ and 3BIJ at Richmond. 3ATZ, 3BVB, and 3ADJ will be ready for work when overhauling is completed.

Newport News stations are coming along fine with the following being lined up 3AAG, 3AAH, 3IE, 3AFJ, and 3AFG. 3MK has his 100 watt C.W. set going now and is battling off at a rapid clip. 3ZZ will soon be there with 500 watts but in the meantime the little 10 watt outfit is doing valiant work.

Second District: 3TJ participated in the 4th of July work and is reaching out in good shape. The A.R.R.L. is represented in Petersburg by two live bugs, 3BNM with 10 watts and 3AUU with 50 watts. The signals of both stations are fine and the traffic report testifies as to their energy. Good work!

Third District: Conditions around Richmond are improving greatly with a number of converted B Ls turning to the relay game. The following stations are counted on to do good work. 3BVL, 3AJG, 3HI, 3BQX, 3BUL, and 3BNN. 3BIJ, Richmond, has lost one of his 50s and is now hopping about on one leg but getting there just the same. Richmond stations are working on regular schedules north and south which accounts for the large amount of traffic handled there.

Fourth District: 3BLF, Richmond, is holding down this district alone. Rectifier trouble has hindered but despite that msgs. have been handled, mostly on regular schedules.

Fifth District: This likewise is a one station district with 3IW the station with a traffic report that is mighty good. 3IW has hooked with Richmond in daylight which, considering the QRM from high power stations and hams around Washington, is very good. His sigs are strong everywhere and he is one of the most consistent traffic men in the division.

Eighth District: 3BZ and 3AEV both manage to squeeze in a few msgs. between business and A.R.R.L. organization work. Daylight work with Richmond and Greensboro accounts for a good bit of their traffic.

Ninth District: Stations are scarce in this district at present, 3CA, 3RF, and 3BIY are out for overhauling. 3BIY is undergoing a real overhauling since he has just added an O.W. to the outfit. 3HL has junked the spark and is now working C.W.

Tenth District: 3AOV has had very little time for radio but looks forward to the day when he will be back with both feet and C.W.

NOW fellows here is something worth

digging for. To the station having the largest percentage of increase in traffic handled between August 20 and December 20 over the traffic handled April 20 to Aug. 20 we are going to award a combination 0-15 and 0-150 volt voltmeter. A precision instrument to keep the batteries in good shape and general testing purposes. If you handled no msgs. during April 20 to Aug. 20 period or if during any month in that period no msgs. were handled a handicap will be set equal to the average number of msgs. handled by similar stations of the same power in your immediate vicinity. The instrument is donated by a concern interested in Citizen Radio. A fair chance for all. Who gets the Xmas present?

Lets go!

ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

The reorganization of the Rocky Mountain Division now shows the following lineup: N. R. Hood, 1022 So. Ash St., Casper, Wyo., Division Manager; R. C. Schryver, 2111 So. Franklin St., Denver, Colo., A.D.M. for Colorado; Philip Laskowitz District Supt. in and around Denver; Glen Garner, 583 36th St., Ogden, Utah, A.D.M. for Utah; Ralph Baker Supt. Dist. No. 1 in Southern Utah; Evan Seegmiller, Supt. Dist. No. 2 in northern Utah; and F. N. Mitchell, Box 575, Greybull, Wyo., A.D.M. for Wyoming. No Dist. Supts. assigned as yet for Wyoming.

The division is now on a business basis and results are now showing up altho the summer season has been a hard time to reorganize and to keep interest up at the same time. Routes north and south thru the division run as follows: Denver, Cheyenne, Douglas, Casper, Greybull, and thence to Montana points. The Utah north and south routes are thru Richfield, Salt Lake, Ogden, and thence into Montana. Routes east and west run thru Colorado into Utah and from Nebraska thru Wyoming into Montana and other points in the Northwest Division.

COLORADO — 9BJI, 9DTH, 9DUC, 9AYU and 9BXA have all been on their vacations which accounts for small amount of traffic from Colorado this month. 9AMB is still carrying on relay work in his customary manner. He has installed a 5 watt set for the first thousand miles and saving the 50 watter for DX work. Wonder what he calls DX work. A good many fellows are rebuilding for next winter. 9DVA who had the wonder 10 watt set last winter is building two 125 foot masts and a shack on the edge of Denver and as he puts it there will be just one relay from New York to Honolulu and that will be 9DVA's 200 watt set. 9AJA who has been in Chicago last winter is with the Colorado amateurs again located in Denver. 9DHI

is rebuilding, installing 10 watts C.W. for his $\frac{1}{2}$ KW spark and a Reinartz tuner. Colorado will be a C.W. state 100% judging from the progress made in the installation of C.W. sets in that state the last few months.

WYOMING—7LU is being heard from the west coast as far east as the Ohio river. A daylight route was open thru the State from 7ZV spk. at Douglas to 7ZO C.W. at Casper to 7LU C.W. at Greybull and during the tests 7LU and 7ZO were in touch with all tubes out of their sockets but one lone 5 watter and worked 170 miles daylight over mountains and bad lands. QRN is fierce in this State especially around Casper and Douglas, there being lightning storms about fifty evenings out of each week which fill the Wyoming ether with QRN.

VANCOUVER DIVISION

W. D. Wood, Mgr.

The month of July in the Vancouver Division has been rather slow in the relay field, but other amateur activities are going ahead nicely.

No traffic has been handled with any Canadians outside of the local work. The only eastern Canadians to get across the Rockies this month are 4BV and 4CB, both on C.W. To the north, Prince Rupert has been unable to reach Vancouver so far, but things are going ahead up there and 5CX and 5AX will be on C.W. this fall. 5CT and 5DX have got across to the nearby "7s." To the south 7BK, 7GE, 7VZ and numerous other sparks are still easy to work, but not as reliable as in the good season. QRN makes a worse mess of things in the summer than QRM does in the winter. 6KA comes in at Vancouver like a local station and is heard here almost any night. 9BD can work 7QW in Spokane any night "rain or shine." 7QW is on C.W.

WEST GULF DIVISION

F. M. Corlett, Mgr.

NORTH TEXAS SECTION: Every station in and around Waco seems to be undergoing repairs which has cut down the traffic handled considerably. 5ZAF has moved his station to the Sanger Bros. Department Store. Relay work can be done almost any time during the 24 hours. 5IQ has rebuilt both his receiving and transmitting sets. 5MK at Ennis, Texas, is moving to Dallas.

OKLAHOMA: You fellows who think you know just where to tune in order to get Oklahoma stations just as well scratch new marks on your tuner. U. S. Radio Inspector Deiler has been in our section and with the aid of his "leather box" has caused several stations to make radical shifts in regard to wave length and decre-

ment; operators of C.W. stations are also getting some *real* dope as to what their wave length actually is and will no longer have any excuse for using anything from 200 on up.

To LeRoy Moffett, Sr., dad of 5HK, we hand the cake for being an expert mast builder. Moffett has just succeeded in completing a 122 foot mast which stands solidly, without the use of a single guy wire. Some pole we say! 5ZG has a new C.W. set. 5BM is busy rebuilding during the summer. 5ZM is pounding through in fine shape on spark but atmospheric conditions will not allow much traffic via this method. 5PU, 5LB and others are on the job part of the time. 5ADQ is a new spark that has started up in Oklahoma City. As is always the case, about every station in the state during these summer months is being "re-built" (which usually takes all summer!). Rebuilding is something that we must do sooner or later and of course summer is picked as the best time for it, but what we can't see is why everyone, seemingly, dismantles their set at the same time. This entirely eliminates short jump routes just at the time when they are actually needed and the inevitable result is indicated by reports similar to ours of this month; few or no messages handled. Whaddusa Oklahoma "ops," can't we improve this situation and handle a little more traffic?

SOUTHERN TEXAS SECTION: It is most encouraging to see all districts come in with their reports voluntarily, and on time. East Texas is just scintillating with enthusiasm over prospects and early attempts at short relay work. 5KN has pepped up the gang and has developed 5OC, 5PZ, and 5XAD—two sparks and two C.W. Our fondest hopes of a traffic outlet to Nola are taking shape thru their efforts. Galveston shows signs of fight because they have not had sufficient representation in the section reports. That's the stuff, fellows. Glad that you have shown signs of life, the space is here for all live wires, so if you fellows will only live up to half of your threats, we will be most proud of you in our traffic organization. 5CQ has divided, Mora moving to La Marque and Levy continuing. 5ACR on C.W. is the most consistent station. 5TT and 5BV are spark, while 5VY, 5IM, and 5ADY are dashing it out with 5 watters with prospects of the usual increase in number of tubes. Goose Creek has two good stations in 5AEI and 5AFY. Houston is being represented during the summer month by 5AE, 5BA, 5PB, 5NK, 5PO, 5NN, and 5ZX, all C.W. 5XB will be a feast for the eye as well as the ear this season, the A.D.M. having recently made a tour of inspection in that district and found things being put in fine shape. 5ZP has a single
(Concluded on page 41)



International Mix-ups

In the "Calls Heard" section of the *June* QST, "Ex-3AHA" mentions hearing a C.W. station signing 2LZ call 2OM and later ask station 2MZ what wave 8MT works on, and then calling 8MT, etc. The report read as if ex-3AHA believed these to be U.S. amateur calls, but Leon Deloy, French 8AB, volunteers for the sake of accuracy that they probably were not. 8MT is a French amateur somewhere in Somme and French 8AB has itself worked British 2OM and we know from the British magazines that there are such stations as 2LZ and 2MZ. Thus we have a very pretty international tangle: American ex-3AHA, while in harbor in Germany, overheard British 2LZ calling French 8MT!

Very shortly the need will become imperative for an international agreement where the nationality of the amateur stations, both the caller and the one called, will be evident by the call, the intermediate signal, or some special prefix. Mr. Deloy suggests that the initial of the nationality might serve as a prefix to the call letters.

Another Transatlantic Echo

As an outgrowth of last winter's Transatlantic Tests we have had the pleasure of meeting Marconi Inspector D. E. Pearson, the checking operator who sat in with Paul F. Godley at Ardrossan as a representative of British amateur radio. Mr. Pearson arrived in New York recently on the S. S. "Elysia" from Glasgow to Boston and while in port was the guest of Mr. Godley. Our readers will remember that at the request of Mr. Philip R. Coursey, editor of "Wireless World," the British Marconi company kindly placed the invaluable services of Mr. Pearson at the disposal of our representative and Mr. Pearson was on the job thruout that history-making but tortuous ten days.

At dinner at the Engineers' Club in New York on July 31st the A.R.R.L. president, traffic manager, treasurer, and secretary had as their guests Mr. Pearson, Mr. Godley, and Mr. H. H. Beverage, developer of the "Beverage wire" the use of which contributed substantially to the success of Mr. Godley's mission. Mr. Beverage, it will be remembered, sailed on the same vessel as

Mr. Godley, and had just returned to this country after nine months in South America, Africa, England and Central Europe.

Mr. Pearson is a most likable fellow, immensely interested in American amateur radio, and keen for the possibilities of two-way amateur telegraphy between the two great English-speaking nations. We told him, by the way, how his assignment at Ardrossan had been the envy of every American ham—how any amateur in the U.S.A. would have given a leg to have sat in with Mr. Godley on the Scotch coast and heard our American signals come rolling in. "Well," he smiled, "when I think of the weather we had some of those nights, there was many a time they could have had the job!" But he didn't mean it. He confessed that when he first heard of Godley's arrival he had scouted the possibility of receiving signals, but when he saw that super-heterodyne he decided that he would withhold judgment—it had more tubes than any amplifier he had previously seen. And now he has an immense respect for its performance and for the accomplishment of the American amateurs whose signals "got over."

We hope that Mr. Pearson can come back to this country soon—there are thousands of amateurs eager to meet him and shake his hand.

Canadian Regulations

The Canadian Radiotelegraph Act of 1912 does not lay down any operating rules but gives the administrative department the power to make regulations from time to time, making revision of regulations possible at any time without unnecessary red tape and delay. The department is very favorable to the amateur and is willing to let him have his fair share of the ether. They do not recognize any distinction between the various classes (telegraphers and broadcast listeners) and are very anxious that these two groups live at peace with each other without interference from headquarters.

The wave length limits favor C.W. transmission, amateurs being permitted up to 180 meters for spark and up to 200 for C.W., while experimental stations observe

the same maximum for spark but may use 275 for C.W. The maximum power permitted is 500 watts, which is not all that might be desired for spark, but the spark is rapidly dying in Canada and nobody wants or can afford more than that in C.W.

Chinese Strays

With communication to Hawaii an established fact we all wonder what next. We have dared to venture several wild guesses which came true and now we are looking for new lands to conquer. Mr. E. T. Lockwood has been an ardent pusher of radio in China and we are greatly indebted to him for the following information gleaned from some of his interesting letters.

It is rather apparent that the Peking government has been so busy with political affairs of much importance that amateur radio has not been seriously considered except to give out the general order that no radio stations are allowed. In places this rule has not been carried out against foreigners, or in cases where the circumstances are extenuating, or where a special license has been granted. Shanghai, the principal port and probably the most influential city of China is, for the most part governed by an international Municipal Council and is not subject to jurisdiction of the Chinese government. Here amateurs have been permitted to erect stations and transmit on whatever they please without restriction. Several government and commercial stations are in the vicinity. FFZ, owned by the French government, often reprimands the amateurs near their wave but no drastic action has been taken to curb the few too enthusiastic hams.

It has been estimated that there are a hundred amateurs in Shanghai. They have never gotten together to form a club because of the difficulties of nationality, being mostly American, British, French, Italian, Japanese and Chinese. Because of the legal reasons mentioned above the Shanghai experimenters form most of the amateurs in China and for the most part confine their efforts to receiving. There are perhaps four or five amateur stations equipped to transmit with moderate power but they have no place to communicate except across

town. As in nearly all parts of the world except the United States and some European countries, material for construction of sets is very scarce. Vacuum tubes and other equipment are rated as a commodity and not only retail for several times their value in America but are classed by the customs officials the same as guns and ammunition, and often require special permits from Peking in order to import them. These permits needless to say cost much time and trouble.

It appears that amateurs in Japan would be under such restrictions that the establishment of a high power relay station would not be permitted. This necessitates direct operation between Hawaii and China for relaying to this country. The distance is greater than we have yet attempted, for from the U.S. to Hawaii is but a third of the way to China. We hardly dare venture a guess as to the power necessary but with

the coming of better methods of receiving we still have high hopes of completing the trans-pacific jump. Needless to say the traffic both ways would be heavy as the cable rate is \$1.50 per word and delays are frequent.

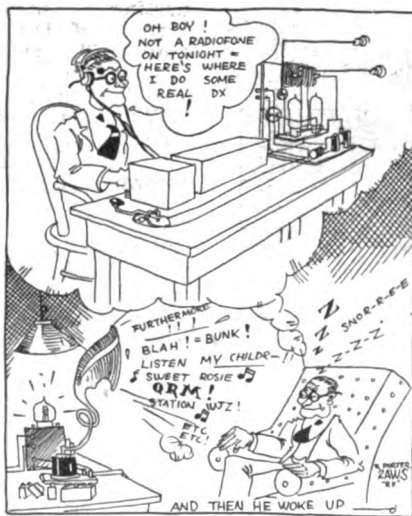
British Broadcasting

British manufacturers are extremely busy in anticipation of a broadcasting boom this winter. The importation of receiving sets has been forbidden and all the sets will be British-made. Altho doubtless this will be a disappointment to some American manufacturers, such action was necessary to protect

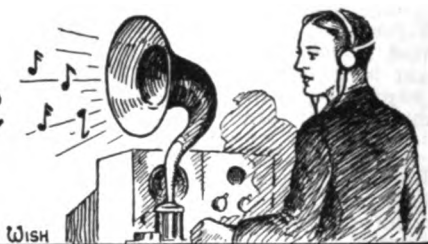
British industry against Germany, who it was feared would push in crystal sets for next-to-nothing.

Meanwhile we have no reliable information on the conditions under which broadcasting will be carried out in England. We understand the matter has been settled in some manner but at last reports the Postmaster General and the manufacturers still had their differences. Majority sentiment seems to be in favor of forming a broadcasting company with sufficient capital to build the eight contemplated broadcasting stations, to cost approximately £20,000 each, the money to be subscribed by the various firms in proportion to their status. To operate the stations it has been proposed that the manufacturers pay to the operat-

(Concluded on page 41)



With Our Radiophone LISTENERS



Two complete receiving stations are being installed in a 72 family apartment house in Newark, N. J., with a directive loop on each set pointing to a particular broadcasting station. An operator is in charge of the equipment and connects the programs picked up to two complete circuits that run to each of the 72 apartments, so that the tenant may plug into either concert.

Denver has a new broadcasting station of considerable size—KFAF. It was installed by E. F. Horn and is one of the largest on the west coast, employing two 50-watt tubes



for the master oscillator and Heising modulation and amplification of this modulated high frequency energy by means of two 250-watt tubes giving a total output of 550-watts into an antenna 120 ft. high. The station was built by the Western Radio Corporation.

A short time ago Mr. Geo. R. Call of 92U had the opportunity of installing and operating a receiving set on a special train of the Chamber of Commerce on a tour of South Dakota.

The equipment consisted of a Westinghouse RC set with a two step power amplifier and magnavox. The aerial was a single wire about ten inches above the two rear steel coaches. Ground connection was made to the truck of one car. The operation of the loud speaker did not prove satisfactory when the car was in motion as the noise to be overcome was too great and the

rattling of the tubes and horn made considerable surplus noise. The receivers not only made the signals more clear but kept out a great amount of extraneous noise.

Leaving Sioux City, Iowa, the station of the Sioux City Radio Laboratory was picked up while broadcasting the morning news and heard all over the observation car. The station of the University of South Dakota at Vermillion was heard connecting up with Sioux City and was informed of the departure of the special train. The passengers were then given a talk of welcome and were informed they would be met at the station.

When the train had pulled ten or fifteen miles out of Vermillion the Dean of the Engineering College gave a very eloquent farewell address over the radiophone. This was very easily picked up and greatly enjoyed by all who heard him. All along the route there were a number of amateurs who were at the railroad station with copies of all the broadcasts thinking possibly they had not been picked up on the train. Both Sioux City and Vermillion were heard up to about 225 miles, or a point just west of Chamberlain. Those interested in the stock market were kept informed and many news items were picked up while enroute.

When following power lines a continual a.c. hum was heard and induction from railroad telegraph wires, fans, and generators on the train caused some annoyance. These troubles must be remedied before communication with moving trains is perfected to a high state, which does not appear to be very far in the future. Experiments such as these contributed to the advancement in this field and point out the uses to which communication with moving trains can be put.

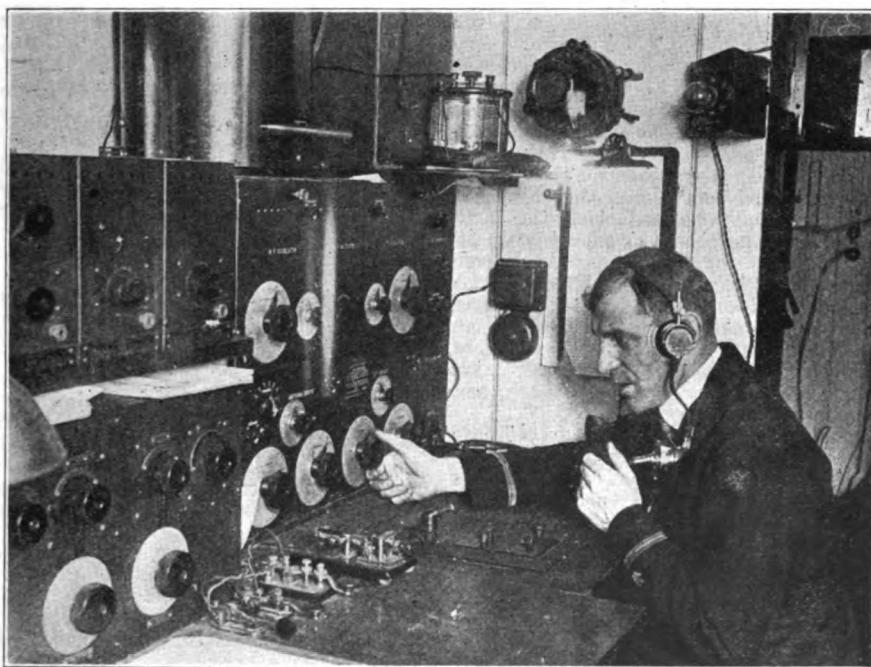
WJZ in a Row

Recently we mentioned that the broadcasting stations in the vicinity of New York had got together and agreed upon a division of operating hours, co-operating much as we amateurs do in a local "Plan." All but WJZ. WJZ, it is said, has declined to join with fifteen others in a schedule, holding that its better programs justify it in broadcasting continually from 7 p.m. until midnight. Petitions are being sent Commerce, we hear, urging the revo-

cation of WJZ's license; meanwhile WJZ is taking a poll of public opinion to see whether the station shall continue on the air all night or shall cease altogether—which the management threatens as an alternative.

WJZ is operated jointly by the Radio Corp. and Westinghouse. In the meantime a new G.E.-R.C.A.-Westinghouse station is being constructed in the heart of Manhattan and upon its completion will supplant WJZ. We hear that J. O. Smith will be the manager of the new station.

9:00 a.m. to 10:50 a.m. Amateurs
 10:50 a.m. to 11:05 a.m. Quiet for time signals
 11:05 a.m. to 4:00 p.m. Broadcasting
 4:00 p.m. to 6:00 p.m. Amateurs
 6:00 p.m. to 8:55 p.m. Broadcasting
 8:55 p.m. to 9:01 p.m. Quiet for time signals
 9:01 p.m. to 10:00 p.m. Broadcasting
 10:00 p.m. to 8:00 a.m. Amateurs
 The broadcasting stations in each city are getting together themselves now, and subdividing the portions of the day scheduled



THE RADIOPHONE ROOM ON THE S. S. "AMERICA." The "America" is equipped with experimental Western Electric phone equipment and many of our readers have listened in to her long distance experiments with 2XJ, Deal Beach, N. J., over remarkable distances. Above the bell at the operator's right may be seen an oil-filled variable condenser sitting within a coil of heavy wire. These form a wave trap which is part of the circuit arrangement which makes duplex working possible so that conversation may be carried on in both directions simultaneously, like a land telephone. The "America" is also equipped with an Armstrong super-heterodyne receiving system, we understand, the first vessel to be so outfitted.

(Photo by Kadel & Herbert.)

Texas Time Division

The Dallas Radio Club and the Ft. Worth Radio Club, acting at the suggestion of West Gulf Division Manager Corlett, recently appointed committees who met with representatives of the many broadcasting stations which those two cities now have, and as a result an allocation of operating hours was agreed upon which will prevent conflicts, eliminate interference, and do much to restore the harmony of pre-broadcasting days. The schedule is as follows:

8:00 a.m. to 9:00 a.m. Broadcasting

for broadcasting. Such an arrangement is heartily to be commended; the broadcasting stations do a minimum of self-jamming, amateur interference is eliminated, and the amateur gets a portion of the evening to operate in peace without being smothered by the fuzz from local broadcasters and without feeling that ten thousand of his townsmen are heaping damnations on his defenseless head. The present plan is a concrete exhibition of that co-operative effort we have so strongly urged upon our members.

(Concluded on page 41)



Every now and then an application for affiliation with the A.R.R.L. is received from some club which seems to have been organized for the purpose of utilizing the good name of our A.R.R.L. on its stationery as a lure for the innocent novice who is seeking information. The novice has come to know that good sound advice comes from an A.R.R.L. man and he seeks such acquaintances in the various clubs throughout the country. A number of these clubs can be recognized by the fact that they are so eager to use "affiliated with the A.R.R.L." on their stationery or monthly publication that this form is being used even though the club has not been affiliated. A club is affiliated only after the Operating Department has satisfied itself through an investigation that the club is worthy of such affiliation and the Board of Direction has given final approval of acceptance, and such announcement appears in *QST*.

The A.R.R.L. has no desire to affiliate clubs which have a tendency towards commercializing the interest of the amateur and when satisfactory evidence cannot be given as to the worthy qualification of clubs filing application for affiliation, the A.R.R.L. will not consider such application any further unless the investigation shows the purpose a righteous one.

True, we want more clubs to affiliate with us so long as they can conscientiously share our views in the same spirit, but we must draw a line on the club that is organized from the commercial standpoint and hopes to thrive on the use of the name of the A.R.R.L. without authority.

Worcester County Radio Association

A radio exhibit to consist of receiving and transmitting equipment is to be held under the auspices of the W.C.R.A. during the New England Fair at Worcester, September 2nd to 6th. The radio show will be held in a large building suitable for a number of exhibits.

South Jersey Radio Association

During the month of September the new Armstrong super-regenerator will be demonstrated by members of the club. The demonstration will be for the benefit of the public. The club boasts of 200 members with practically every member a member of the A.R.R.L. (Let us know how you come out on the A. S/R.—T.M.)

Radio Club of Hartford

The Radio Club of Hartford will resume its meetings beginning with September. During the summer months the club ceases its meetings because so many of its members are away on vacations and there is no enjoyment when interest is at low ebb.

New Haven Radio Association

"One of the best organized clubs that ever held a meeting," is the boast of the New Haven Radio Association. The roll contains the names of 300 members. A great many of the novices are being instructed in the telegraph code for which a complete set of Victor records has been loaned to the club. The records are loaned to different members for several days and in that way everyone has a chance at them.

Flint Radio Association

Probably no other club in the middle west has done as much for the novice as the Flint Radio Association. Hours are so regulated that the broadcast listener does not know what local QRM means and he knows that after 10:00 P.M. the telegraphing A.R.R.L. man comes on the air. The club has done much through the medium of local newspapers, advising the novice against these "fly-by-night" radio shops. (We need some more "Flint" Clubs—T.M.)

The South Bend (Ind.) Radio Association gave the first radio dance ever held in South Bend on June 28th. The dance was a great success and everyone enjoyed themselves.

The radio club is holding meetings thru the summer every other Friday night at the Y.M.C.A. On July 14th a debate was scheduled on the subject, "Resolved that spark is inferior to the continuous wave method of transmission." All A.R.R.L. radio clubs are invited to correspond with this live wire bunch by addressing, V. A. Bloomquist, 510 Sherman Ave., South Bend, Ind.

Radio Club of Irvington, N. J.

Edward W. Heim gave a very interesting talk on audio amplification at a recent meeting which was well attended. Questions are answered at every meeting for the novice. Thursday is the meeting night.

The club is anxious to correspond with other organizations. Address all communications to the club at 17 Union Ave., Irvington, N. J.

West Philadelphia Radio Association

Meetings are held every Thursday evening in the lecture hall of the Library Building, at which time interesting papers are read. 95% of the club members are members of the A.R.R.L. The officers are: A. R. Muncey, Pres.; M. J. Duddy, Secy.; and C. W. Lyon, Treas.

The Year Book of the C. C. R. A.

Bound in a handsome blue cover with the emblem of the Chester County Radio Association done in blue, white, and gold, comes to us the year book of this association.

Its pages chronicle the activities of the C. C. R. A. for the past year. The description of 3ZO and 3XW is illuminated with splendid half tones. With a cut of the charter of affiliation with the A.R.R.L., appears a list of the names of members of the association. Several highly interesting articles are given, including a brief outline of the new Armstrong super-regenerative receiver.

We congratulate the C. C. R. A. on the very excellent piece of work and thank the members for their kindness in sending a copy to headquarters.

OPERATING DEPARTMENT

(Concluded from page 35)

tube 50 watt set in good shape and doing about all the work for that district.

South Central Texas has not been a busy district this summer because of incessant QRM from the 2KW fone set at WCM which seems to find use for most of the hours of the day and nite, but with the coming of DX season some arrangement will be made whereby 5ZU, 5QA, and 5ZAG, three efficient C.W. stations will be in the air. South West Texas, while not a fast growing traffic moving district is, however, fast growing in renewed interest in A.R. R.L. work. Mr. Nettleton is back again after a trip into the heart of old Mexico and is glad to report the installation of a 15 watt fone and C.W. set that will put him back on good terms with the fraternity. 5ZAE and 5ZAN seem always tied when it comes to continued pep.

WINNIPEG DIVISION

J. A. Gjelhag, Actg. Mgr

4CB has installed a C.W. station for 4GB. Static is still very bad most nites for any long distance work, but occasionally we hit a fair nite. 4BR is again on the air with a 20 watt English tube doing very

nice work. 4BV is still going but is very busy rebuilding and experimenting.

4CB is rebuilding and waiting for new parts. He has a small receiving set of two steps of R. F. A. and detector going temporarily which works very well so far. 4CB will be heard all over the Province when we get better radio weather.

Come on, fellows, "blow you horn" to your Dist. Supt. Give him something to report and show that you are alive. I can't report your troubles or anything else when I don't hear from you. Get busy right now on that "All Canadian Transcontinental." We want that going by winter and by all means don't let the Winnipeg Division be one of the last in line, be one of the first and the rest will follow.

DOPE ON MAST CONSTRUCTION

(Concluded from page 32B)

on two sides only and total approximately 125 board feet.

1 piece 5½ in. x 5½ in. x 5 ft. redwood
or cedar
2 pieces ¾ in. x 7 in. x 16 ft. yellow
pine

4 pieces ¾ in. x 5½ in. x 16 ft.
4 pieces ¾ in. x 4 in. x 16 ft.
2 pieces ¾ in. x 2½ in. x 16 ft.
1 piece 2½ in. x 2½ in. x 12 ft.

A mast of any height can be made by modifying the dimensions somewhat, but it is hoped that the reader has obtained some helpful suggestions from this article which will aid in building a mast to meet his needs.

OUR RADIOPHONE LISTENERS

(Concluded from page 39)

The station of the Ft. Worth "Star-Telegram" and of the City of Dallas, WRR, are A.R.R.L. member-stations, handle A.R. R.L. traffic and their operators are members of the local affiliated clubs. Another pleasant feeling is had by reading the radio department of the Dallas "Times-Herald;" they have a radio editor who is a radio man and writes intelligent radio articles! This paper is a friend of the amateur, boosts the A.R.R.L., boosts good old WRR, and donated some real jack towards sending the Dallas crowd to the National Convention last year.

INTERNATIONAL AMATEUR RADIO

(Concluded from page 37)

ing company a certain percentage on their sales or, as an alternative suggestion, that the government collect an additional fee with each "listening-in" license, the additional sum to be placed in a common fund to provide for the programs.

Who's Who in AMATEUR WIRELESS



NICHOLAS H. JENSEN

"Nick," as he is known locally, was born May 19, 1884, at Maquoketa, Iowa. Remaining single until a few weeks ago he has given lots of time to League work. His main occupation is Chief Deputy United States Marshal for South Dakota. In this work he takes active part in keeping 22,000 Indian inhabitants on the straight road and seeing to it that all poor moonshine is destroyed.

Bro. Jensen first became interested in radio in 1917 when the Navy Recruiting Officer asked what the Morse characters were for C and Y. He apparently answered correctly and "signed on the dotted line" (and twenty other dotted lines). Doing the required time at Great Lakes Training Station and Harvard he absorbed all of radio. His longest stay was on the U.S.S. Florida where for over a year he hung around the Grand Fleet of

(Concluded on page 58)



ALFRED EDWARD BANKS

Major Banks of San Diego, Cal., entered the amateur game to promote radio for his two sons and then, despite his forty odd years, became as great a fan as either of them. "A really good operator is hard to make after boyhood days have passed," he says, "and to become facile at copying after forty is a difficult problem." Notwithstanding this he gets as much kick out of the radio art as the most enthusiastic youngster and besides is the father of a couple of good ones.

Beginning as 6IY he at first confined his efforts to spark and adopted a non-resonant type transformer with a high note. The Boy Scout problem interested him to the extent that he instituted one of the first radio schools for Scouts in the United States, 6VL, and was instrumental in organizing and perfecting a plan for teaching which has been useful in many other

(Concluded on page 58)



Amateur Radio Stations

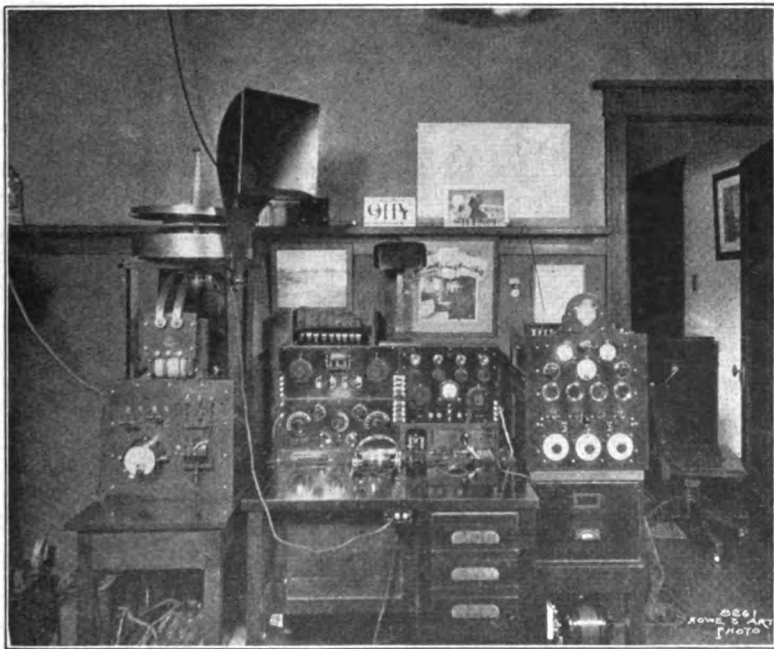


9HY, Chicago, Ill.

Station 9HY is located at 6027 Kimbark Ave., Chicago, Ill., and was completely designed and built by J. H. Jay and C. W. Clark.

A CW set using CW, ICW, and MCW is the principle transmitting unit, while a one-half KW spark set forms a secondary transmitting unit. Either may be used by throwing a switch.

grid variometers with double-tap coupler. Vernier variometers are used in series with the large variometers, which gives an adjustment much finer than a mechanical vernier. In tuning-in CW a complete throw of the vernier variometer dial is equal to but three white lines on the large variometer dials. The tuner is completely shielded with grounded copper plates. The



The receiving set comprises a long wave tuner employing duo-lateral coils, a short wave regenerative tuner, and a detector and three stage amplifier. Either the long or the short wave tuners may be used by throwing a four pole double throw switch. Wave lengths of from 150 meters to 20,000 meters can be covered. The long wave tuner is made up of a triple-coil geared mounting with two 43-plate variable condensers, the latter being a series-parallel condenser. The short wave regenerative tuner is made up of the usual plate and

long and short wave tuners are in identical mahogany cabinets and form a symmetrical lay-out with one above the other.

The detector and three stage amplifier unit is mounted in a large mahogany cabinet. A grid variable condenser and a 43-plate variable phone condenser are included in this unit, as is a 0 to 50 volt meter for giving detector "B" battery readings. A three way cam switch gives an off, "A" battery, and "A" with "B" battery positions. When set upon a low cabinet the above unit forms a complete symmetrical

receiving unit with connections made by short nickel plated bars. There is no howling on three stages as the amplifying transformers are spaced very far apart, the same being true of the tubes.

A small cabinet with one stage of radio frequency forms an intermediate unit between the short wave regenerator and the detector and three stage audio frequency amplifier unit. The plate variometer of the regenerator acts as the radio frequency air core transformer. In this same cabinet is also contained an "A" battery potentiometer.

As the complete receiving set occupies the entire length of the mahogany office desk upon which it is mounted, a provision had to be made for the key under the detector and amplifier unit. A low cabinet with a drawer and an arch opening for the key was made for the above unit which elevates it to the level of the other cabinets. The complete receiving assembly is mounted on plate glass as is the key. A typewriter is enclosed in the desk ready for use by raising a portion of the desk top.

Brown adjustable and Baldwin phones are used. A loud speaker with large horn is used which gives good volume.

Flanked on both sides of the desk are the transmitting sets, the spark set on the left and the CW set on the right. The transmitting units like the receiving units are made to fit into a symmetrical scheme of arrangement. A narrow mahogany table was constructed for the spark set upon which was built a much smaller table arrangement for enclosing the muffled rotary gap. This smaller table placed upon the larger table is covered on the side next to the desk with mahogany as is the top, while the front supports a switch board. On the switch board are mounted the antenna switch, a double pole, single throw switch for throwing the key either in the spark set circuit or the CW circuit, another double pole single throw switch for cutting in either quenched or rotary gaps, and a large Jewel 0 to 5 amp. thermo couple meter.

On top of the little table are mounted an Acme one half KW transformer, a Thorndarson oil condenser, and a very large oscillation transformer. The oscillation transformer is supported over the transformer and condenser in a flat position by four legs. All insulation is very heavy and leads as short as possible. The rotary gap is designed to give the best results with the Acme non-resonant transformer, while an Amrad quenched gap with a line resistance can be used also.

The CW set uses 4 five watt U.V.202 Radiotrons which can be used in two different modulating circuits. Flexibility has been the keynote in the design of this set, and experience the chief advisor. The English circuit described by Mr. Whittier

is used for the oscillating circuit, with a grid coil wound with No. 12 wire coupled inside of the antenna inductance. Either Heising constant current modulation with two tubes as modulators may be used or four tubes may be used as oscillators with a magnetic modulator for modulation. Four air core honeycomb chokes are mounted in a bracket directly underneath the socket shelf, so that a choke is connected near the sockets to each grid. This prevents one tube surging back into another.

Either rectified AC or motor-generator can be used for the plate supply, the set being so wired that either may be used by throwing a four-pole double Federal switch. An Acme 200-watt 550 volt unit rectified through two DeForest rectifying tubes is used for the rectified AC supply. The motor-generator is a special Ray-Di-Co unit with a double-commutator generator delivering 150 watts at 750 volts. It will deliver 1,000 volts open space, and is rated at 150 watts conservatively. A Radio Corporation tone wheel is coupled between the motor and generator, the 1,750 RPM of the motor-generator giving the desired frequency. The center of the tone wheel was turned out on a lathe and it is insulated from the motor generator with bakelite so that it will not ground through this unit. A double brush is used. The filter system is made up of eight 1-mfd. Federal condensers and three 1½-henry Acme chokes.

When using motor-generator the filament winding of the Acme unit is used to light the filaments while the secondary is thrown out of the circuit. In this way the Acme unit serves both as a power unit and a filament heating unit. The motor-generator is used for phone work and ICW, while rectified AC is usually used for straight CW. Very good modulation is obtained on phone with no hum or objectionable carrier wave. A double-throw double-pole switch changes the generator commutator connections from series to parallel, giving either 750 or 550 volts respectively. A big jump in radiation is obtained with the highest voltage with no great stress on the tubes. Although rated at 5 watts, 20 to 40 watts are put into the tubes. The difference in the results did not warrant using larger tubes, and the 5 watt tubes certainly are better economy.

All instruments are mounted on a base and panel, and the whole is placed in a cabinet with small doors in the sides and top for accessibility and ventilation. At the rear of the base is mounted the 200 watt Acme unit with condensers at each side, while over it is a fibre shelf upon which are mounted the two rectifying tube sockets, the chokes, and four Federal condensers. Thus the power and rectifying circuit together with the filter is all in one unit isolated from the rest of the set. Farther forward on the base are mounted

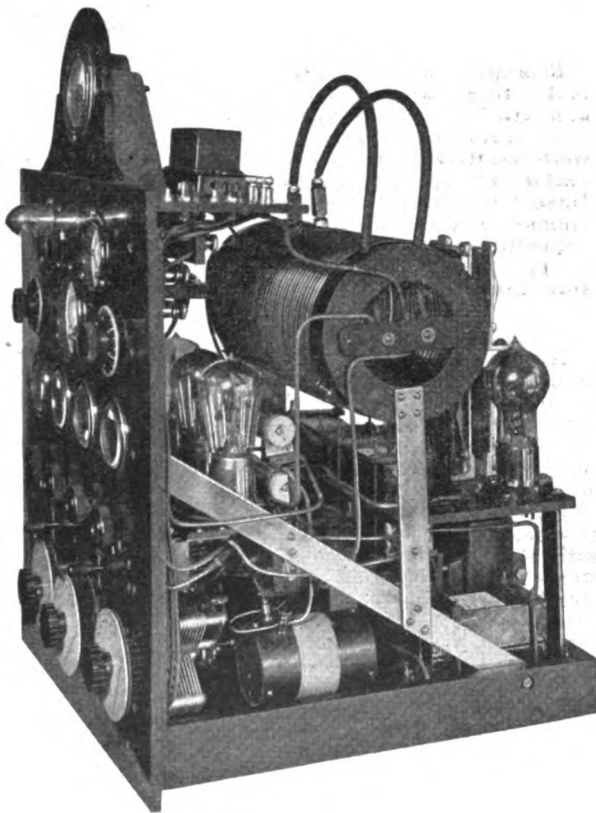
two large fixed condensers over which are supported two 5000-ohm grid leaks and two inductance coils. The antenna inductance is large, consisting of 36 turns of No. 8 brass wire 6 inches in diameter, and is supported by heavy brass uprights fastened to the brass panel supports.

On the panel are mounted an 0 to 600 volt Firco meter, a General Radio hot wire ammeter, a Jewel 0 to 200 milliammeter, and a Jewel 0 to 15 volt AC meter. A small dash pilot lamp is placed over the meters to light the dials. On each side of the meters a 6 ampere rheostat is mounted, one for the rectifying tubes and one as an auxiliary filament control to the oscillators and modulators. Below the meters are four glass peek holes in line with the tubes, which are mounted on a shelf back of the panel. These peeks are large, giving a full view of the elements of the tubes, and bevelled nickel plated brass rims holding bevelled plate glass are inserted in the holes to trim them up.

Below the peeks are mounted four General Radio $2\frac{1}{2}$ ampere rheostats, one for each tube filament. Each individual filament can be set and then all adjusted together with the auxiliary filament rheostat. Below the rheostats three variable condensers are mounted. Just above the condenser dials the two Federal switches are placed, one for sending and receiving, and one for phone, I.C.W. or C.W. The down position of this switch is for phone, the middle position for tone wheel, and the up position for straight C.W. No binding posts whatever are used on the panel, thus giving a clean appearance. The binding posts are mounted high in back of panel on a terminal board, and a hard rubber shelf at right angles to the top of the panel acts as a guide with properly spaced holes to space and feed the leads to the terminal board. On top of this shelf are placed the binding posts for the motor generator and tone wheel, while the Federal switch for throwing from motor generator to rectified AC is mounted to one end of this shelf. Three rotary switches are also mounted on this shelf. One switch is for shorting the milliammeter out of the circuit, which is subject to injury while sending straight CW due to its violent ducking when the key is pressed. Another switch cuts the high voltage plate meter out of the circuit, while the third switch cuts the antenna

series condenser out of circuit, which at times increases radiation. At other times this condenser is necessary, however.

For flexibility and actual results this CW set has exceeded expectations. On straight CW using only two 5-watt U.V.202 Radiotrons, 1,100 miles has been covered. Six stations in New York, Syracuse, Philadelphia and other stations in the east have all reported CW sigs QSA. Langley Field,



Va., also reported having heard phone, which is the best the set has done on phone. Modulation has been reported very good with voice and music. The spark set has been logged as far as Wilmington, N. C., but it is far from being the equal of the CW set. Antenna current on straight CW with two 5 watt tubes has been as high as 2 amps, and seldom less than 1.8 amps.

All wood work in the entire set is of antique brown mahogany with a four-coat rubbed piano finish. A 100 amp. hour 12 volt Willard battery furnishes the receiving filament supply, with eight large cells from a farm light plant for reserve. A Home-charger charging unit of large size keeps the batteries up.

(Concluded on page 58)

Strays



Remember that fool stuff in QST recently about "sending milk by radio?" It's been tried, and, if we may believe the serious assurances of several newspapers in widely scattered parts of the country, with considerable success. The Rochester "Times-Union," for example, solemnly relates the triumph of the local Macaroni in receiving a quantity of milk by radio from Brooklyn, in the presence of numerous witnesses. How can they be that way and live?

QST, Jr.

Armstrong hasn't the only super-regenerator by a darn sight! Coincident with his invention Mrs. K. B. Warner brought out a new model, Betty Jean, weight 8 pounds net, regenerates freely over the whole scale, guaranteed not to warp, crack or mildew.

K.B.W. is named as joint owner of the new device and while not entirely familiar with all the various knobs, dials and constants, he is learning rapidly and hopes shortly to eliminate all howling and other undesirable effects. We earnestly advise the use of a super-audible frequency.

Some confusion has occurred over the choke in Fig. 1 on page 12 of June QST, describing the Reinartz transmitter. How can the r.f. get thru the choke, we're asked. That choke is unfortunately all-too-prominent in the figure; actually it is harmless enough. It's meant to represent one of those very small chokes which are put in grid leads when tubes are operated in parallel to prevent the establishment of parasitic oscillations at ultra-radio frequency. Twenty turns of small wire on a 1/2-inch tube should be about right.

"The Modulator," the amateur magazine of the Second District, was purchased from its publishers by the Second District Executive Radio Council on July 19th and henceforth will be operated by the Council as its organ, beginning with the August number. Wm. F. Crosby continues as its editor. The council will have a publication committee consisting of R. H. McMann, president of the council, F. B. Ostman, 2OM, A. A. Hebert, A.R.R.L. treasurer and director, Mr. Crosby and Mr. Huffman.

Mr. F. D. Webster, call 1AM, (a bit early), past president of the Radio Society of M.I.T. and present treasurer of the Boston Executive Radio Council, has joined the sales organization of the General Radio Company, specializing in meters.

It is with deep regret that we are advised of the death of three of our members, Justis Benderoth of Pine Bush, N. Y., Edward F. Roscoe, Jr., 1BQP, better known as operator of 11BZ, and Everett C. Espy, owner and operator of 8PN of Vandergrift, Pa. Mr. Espy, age 22, has been interested in radio since 1910 although in the DX class only since the war. He had been sick for some time but up until almost the time of his death was active in the local radio club, of which he was vice-president and a charter member.

On page 8 of the August issue the statement was made that if no audio frequency amplifier is used in the super-regenerator the phones may be connected across the .005 mfd. condenser. This is not exactly right as there would be no B battery connection to the first tube. The phones should be connected in place of the primary of the amplifying transformer and the filter circuit may be eliminated if the high pitch of the variation frequency is not distressing or if this frequency is above audibility. The .005-mfd. condenser then is a by-pass across the phones and B battery.

We have the dope that Dr. Louis Cohen, Consulting Engineer for the War Department, has at last perfected a method for eliminating static on short waves. We know all about it except what is used and how it is done. These little details will be cleared up later we are promised.

Amidst all the new things we now hear that John Hays Hammond, Jr., has a method of secret transmission and reception of concerts so that only certain special receiving sets can hear. Good!

1CAE needs a portable, folding, collapsible, counterpoise that will automatically spread out after dark and fold up before daylight without the neighbors or mosquitoes knowing about it. QTC?

Read 'em and Weep

6ZE with two 5-watt tubes and 500 cycles A.C. was heard by 8BHE on one tube on 200 meters.

60M and 6ZZ heard by 1BDU and 1BIY on honeycombs and detector.

1BQD reported 250 miles using 110 volts on plate of tube having 1 watt output.

50I heard off coast of Alaska putting out one ampere from two 5-watters.

6ZX on 15 watts heard by 8CZN in Cleveland.

6ZG works 6ZAC QSA on one five watter.

8EA on 100 watts copied 500 miles west of Astoria, Oregon.

8CAZ on 10 watts copied in California.

8ZZ using 50-watt phone copied over a thousand miles.

9ARZ on one 5-watt tube copied 500 miles west of North Head, Washington, or 2300 miles.

6ZZ has heard 1QP on 20 watts and 1KA.

6KA, 6EN, and 6XAD have been reported quite consistently on the Atlantic coast by a number of stations.

10Z* and 2BLP were working on phone about 11:30 on Sunday morning, May 16th, when 2BLP came back with this: "Sorri, OM but will have to sign off now, because I'm on the local volunteer fire department, the fire whistle is blowing, and I've got to go fight the fire. Cul 73 ... —." Several Bridgeport amateurs heard both sides of the conversation and it has become a standing joke.

Amateur Radio Scores

On August 4th an unidentified man was killed at a railroad crossing near Oxford, Chester County, Pa. He had a card bearing the name of H. E. Rice of Springfield, Mass., but all details were uncertain. The doctor called Mr. H. A. Beale, Jr., who tests his phone sets at 3XW-2ZO every evening, and arranged for Mr. Beale to read off the description of the dead man. The message was picked up and delivered many places and by midnight the "Springfield Republican" called on long distance telephone and identified the dead man. This is just one more incident of rapid valuable public service chalked up to the credit of amateur radio—and Mr. Beale.

Through a typographical error in the advertisement of the Thordarson Elect. Mfg. Co., of Chicago, in July QST the line "Price as illustrated" was made to read \$1.50 instead of \$4.50 to conform with the large type to the right of the cut of the transformer.

Is your hair red? Are your ears too big? If so you are the type that makes the best radio operator, according to Lieut. Commander Richard Condon of the Naval Militia. If you are not loved by the pretty girls you will get along fine with radio. Page 1TS.

HUXTRA!!! Cards and letters have been flooding this office with the tip that 9ZN, the old spark hound, is putting in two 250-watt bottles and is going to use 500-cycle juice on the plates!

Three—Six—Oh!

I think that I shall never know

A wave length worse than 3—6—0,

A wave that has no dot or dash

But sounds like lots of flying hash.

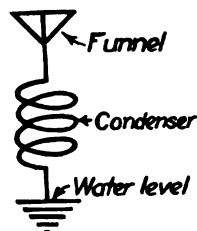
I know a wave that has it beat,

Whose neat C.W. sounds so sweet;

It is the wave of 2—0—0

But never tune to 3—6—0.

—J. W. Eckenrode.



Has anyone noticed the similarity between our A.R.R.L. emblem and the American Rum Runners League?

We note in one of the wonderful "Radio Column" conducted by one of those alleged experts, that as a sign of the remarkable interest this newly discovered hobby has for its devotees, it may be noted that they have banded themselves into an association known as the American Radio Relay League, which, although it is but a few months old already has thousands of members. Ugh!

Mrs. Marie Whitaker, General Delivery, Kansas City, Mo., has asked our aid in locating her lost son, Sidney LeRoy Whitaker. She has traveled from coast to coast but has heard nothing from him since 1919.

Kruse, down in the Gulf, says the static is so terrific he uses a chin-strap to keep it from lifting the phones off!

On page 29 of July QST a formula appeared incorrectly. It should have read:

$$S_1 = \frac{E_1 S_2}{110}$$

9BS in Chicago is unduly flattered on the number of cards he finds at his house every night when he gets home, altho he is not operating his station. To make a long story short, send your reports on 9BS to Mr. H. R. Byerly, Ingersoll, Ontario.

The mail address of our Central Division Manager, R. H. G. Mathews, is now 332 S. Michigan Ave., Chicago, Ill.

Old kid 9S.P. Wright had a "telling" article in the American Radio Journal June 15th that is worth the time of any radio dealer to look up.

Calls Heard



HEARD DURING JULY Unless Otherwise Specified

S. S. Gulfcoast, July 14, 80 miles west of Key West
All C.W. on one tube. QSA thru heavy QRN:
3ALN, 4DQ, 5AAM, 5DO, 5UK, 5IR, 5VA, 6KA
(QSA vy), 8BXH, 8UC, 8ZAF, 9AIX, 9AO, 9DUG,
9BSG.

Can. 3JI, 21 Tennis Cres., Toronto, Can.

C.W.: 1HX, 1IL, 1OA, 1QP, 1RD, 1VT, 1XX,
1AWB, 1AWZ, 1AZD, 1BAS, 1BFE, 1BHJ, 1BKA
fone, 1BKQ, 1BSJ, 1CCZ, 1CHJ, 1CMK, 1CPN,
1CRF, 1CUE, 1CXB, 2FP, 2SQ, 2TS, 2UD, 2AFF),
2AWS, 2AQH, 2BEH, 2BIG, 2BIR, 2BML,
2BNZ, 2BQH, 2BQU, 2BRB, 2BRC, 2CDO, 2CCD,
2CES, 2CFI, 3BA, 3DM, 3CC, 3GH, 3MK, 3OA,
3OT, 3TJ, 3ZZ, 3ADX, 3AFB, 3AFG, 3ANJ, 3ANO,
3BNU, 3BRW, 3BSL, 3BTY, 3BUV, 3CBM, 4BX,
4DC, 4GX, 4KC, 4LP, 4AM, 4AN, 4BO, 4CG,
4EW, 4HJ, 4KH, 4KU, 4NB, 4ND, 4OW,
4PJ, 4QB, 4SM, 4TJ, 4UC, 4UE, 4ZH, 4ZZ,
4ACF, 4ACR, 4ADR, 4AFD, 4AFY, 4AGR,
4AHK, 4AMM, 4ANB, 4AOB, 4AQO, 4AQV,
4AQZ, 4ASZ, 4ATU, 4AUA fone, 4AVD, 4AVL,
4AWM, 4AWP fone, 4AWX, 4AXN, 4AYB,
4AYT, 4BBD, 4BDU, 4BEF, 4BEO, 4BFX,
4BIL, 4BJS, 4BMM, 4BNU, 4BPH, 4BRC
fone, 4BRM, 4BRQ, 4BUX, 4BWA, 4BXT,
4BZF, 4CAZ, 4CBJ, 4CCX fone, 4CEI, 4CFP,
4CGN, 4CGX, 4CHO, 4CID, 4CJH, 4CKO, 4CON,
4CPX, 4CTK, 4CTN, 4ZAE, 4CP, 4DR, 4FK,
4FP, 4OX, 4UH, 4US, 4UU, 4AAP, 4AIX,
4AOG, 4AFS, 4BLC, 4BSG, 4CBA, 4DFB,
4DGM.

4DY, 612 Beresford Ave., Winnipeg, Man. (1 tube)

Spark: 9AYW, 9ZC.
C.W.: 4ASM, 4BEF, 4BLP, 4CAZ, 4CGX, 4CMI,
4KG, 4UC, 4VY, 4AOR, 4AUA, 4AXF, 4BHD,
4BSG, 4DR, 4DKY, 4DGM, 4GL, 4HW, 4NX, 4PI,
4US, 4XL.

M. V. Chesnut, Duncan Cove, N. S. (Near Halifax)

C.W.: 1AL, 1CK, 1EE, 1XM, 1QN, 1ABY, 1ACA,
1ACS, 1ACU, 1AGS, 1ANG, 1ARY, 1AZW, 1BAS,
1BGF, 1BKQ, 1BZW, 1CCZ, 1CHJ, 1CNR, 1CPN,
1HW, 2FP, 2KL, 2TS, 2UD, 2AJA, 2ANM, 2AWF,
2AWS, 2BEH, 2BGM, 2BLP, 2BIR, 2BQU, 2BQH,
2BRB, 2BUM, 2CDO, 2CES, 2COL, 2XAJ, 3BG,
3DT, 3FP, 3FS, 3VW, 3IW, 3XW (fone), 3ZO,
3ZZ, 3AFB, 3AIS, 3ALN, 3ANO, 3ATZ, 3BNU,
4DC, 4AX, 4BB, 4NV, 4PT, 4XE, 4ADN, 4ALF,
4APH, 4AQO, 4ASM, 4ASZ, 4AVD, 4AVL, 4BPL,
4BRC, 4BRF, 4CJH, 4CPX, 4CSY, 4ARK, Can.
9AL.

1CUE, Lincoln, N. H.

Spark: 1AA, 1DY, 1LZ, 1ACO, 2FZ, 2NZ, 2AWF,
8CCX.

C.W.: 1CE, 1GV, 1HK, 1MA, 1PT, 1PY, 1QN,
1TP, 1XM, 1XX, 1ACS, 1ACU, 1AGH, 1AGI, 1AKQ,
1AQW, 1AZW, 1BGF, 1BJS, 1BKQ, 1BPZ, 1BQL,
1BRQ, 1CBP, 1CCZ, 1CED, 1CES, 1CFI, 1CHJ,
1CNE, 1CNR, 1CPN, 2BG, 2DN, 2EL, 2KK, 2NF,
2FP, 2OM, 2SQ, 2UD, 2ZM, 2AER, 2AWF, 2AWH,
2AWS, 2BEH, 2BKL, 2BML, 2BQH, 2BRB, 2BRC,
2BTJ, 2BUA, 2CGX, 2CKK, 2CLP, 2COL, 2BY,
3CM, 3GX, 3GZ, 3OT, 3TS, 3ZO, 3ZZ, 3ACY,
3AIS, 3ALN, 3ANO, 3ARB, 3ATZ, 3AWE, 3AWH,
3BFU, 3BLF, 3BNU, 3BRW, 3BQD, 3BQU, 3CBM,
3LB, 3XE, 3ABL, 3ACF, 3AMM, 3APH, 3AVL,
3AWM, 3AWP, 3BJS, 3BZF, 3CJH, 3CKO, 3CPX,
3CUC.

1AZD, Gloucester, Mass. (All C.W.)

(1FF), (1GV), (1HX), (1PT), (1SC), (1VT),
1XM, 1ACS, (1ADC), (1AGH), (1ASF), (1AZW),

(1BAS), (1BBM), (1BDI), (1BDV), (1BES),
(1BLN), (1BNT), (1CFI), (2BG), 2BN, (2FP),
2KL, (2QR), (2NZ), 2TS, 2ACW, 2AJA, 2ARY,
2BDV, 2BCK, 2BCH, 2BFX, (2BNZ), (2CBG),
2CBW, 2CHZ, 2CMS, 3BM, 3BZ, 3CC, (3FS), 3FU,
(3IW), 3MK, 3ZO, 3AAO, (3ADX), 3BCF, 3BIV,
3BVI, 3BLF, (3BNU), (3BRC), 3BRW, 3BTY, 4BX,
4DC, 4GL, 4ID, 4AL, 4BD, (4BQ), 4EW, (4HJ),
4KW, 4MP, 4PK, 4VC, 4XE, 4ZZ, 4AFD, 4ARL,
4ALF, 4AMM, 4AOL, (4ARI), 4ASM, 4AWM,
(4AVD), 4AVL, 4AVT, 4AXC, 4AZV, 4BBD,
4BCF, 4BIC, (4BIL), 4BQO, 4BQZ, 4BRT, 4CAZ,
4CCX, 4CFP, 4CHL, 4CKO, 4AL, 4EI, (4AIX),
4ALK, 4AWH, 4CBA.

1ACU, Groton Long Point, Conn.

C.W.: (1GV), 1HX, (1IV), (1OZ), 1PY, 1QN,
1RH, (1SW), 1XM, (1XX), (1ACS), (1AEG),
(1AGH), (1AGI), (1AIP), 1AJP, 1ARY, (1AWB),
(1AZW), 1BFE, 1BGF, (1BKQ), (1BQT), (1CBP),
(1CCZ), (1CJA), 1CPN, (2BG), (2FC), 2FP, 2FZ,
(2KL), (2MJ), (2NZ), 2OE, (2OM), 2RM, 2RY,
2SQ, 2TS, 2AHK, 2AJA, (2AJF), (2AJW),
(2AWS), 2AWT, 2AZC, (2BDU), 2BDG, 2BEB,
(2BEH), 2BEM, (2BFZ), (2BIR), 2BJO, (2BLP),
(2BML), (2BNL), (2BNZ), (2BQH), (2BQU),
(2BRB), (2BRC), (2BUF), 2BUM, 2BYC, (2CAH),
(2CBG), (2CBW), (2CCD), (2CCU), (2CEI), 2CES,
(2CLJ), (2CNZ), (2COL), 2CPK, 2CRT, 3AS, 3BA,
3BG, 3BZ, (2DT), (3FR), 3FS, 3HL, (3MK), 3OD,
3OT, 3PB, 3QV, 3RW, 3TJ, 3VW, (3XA), 3ZO,
3ZZ, 3ABB, 3AFB, 3AIS, 3IPB, 3ALN, (3ANJ),
3ANO, 3BGT, 3BHL, 3BIT, 3BJY, 3BNU, (3BVC),
3CBM, (4BX), 4DC, 4GX, 4AM, 4BG, 4BQ, 4JU,
4UC, 4SE, 4SP, 4KE, 4ACF, 4AFD, 4AMM, 4ANB,
4AQO, (4ASZ), 4AVD, (4AVL), (4AWM), 4BDB,
4BDN, 4BDU, 4BKE, 4BRC, 4BRM, (4BRW), 4BXH,
4CFP, 4CGX, 4CJH, 4CKM, 4CKO, 4ZAC, 4ZAE,
4EI, 4AIX, 4APS, (4CBA), Can. 9AL.

Spark: (1BVB), (1CDM), (2DI), (2DN), (2MN),
(2OM), 2AID, (2BQZ), (2BSC), (3BFU), 3FP,
3QX, (3BVC).

1GV, Providence, R. I.

(1ACU), (1AGH), (1AJU), (1AZD), (1AZW),
(1BKQ), (1BQD), (1BQK), (1BWJ), (1CBP),
1COZ, (1CDO), (1CFI), 1CGF, 1CHJ, (1CMK),
(1CMP), (1CPN), (1CRF), (1EE), (1FS), (1HX),
(1PT), (1PY), 1SC, (1YK), (2BML), (2BQH),
(2BQU), (2BRC), (2BUM), (2CBG), 2UD, 2VC,
(3AEV), (3ADX), (3AFB), 3AJD, 3ALN, (3ANJ),
(3ANO), (3ATZ), (3BIJ), (3BLF), (3BNU),
(3BVC), 3CBM, 3FS, (3DT), 3IK, (3IL), (3LP),
(3MK), 3OT, (3VW), (3WF), (4DC), 4DQ, 4GX,
(4IL), (4AN), (4AFD), 4ATU, 4AQV, (4AVD),
(4AVL), 4AWM, 4AWP, 4AXB, (4BBD), 4BDU,
4BEO, 4BKE, (4BLT), (4BNU), 4BNU, (4BPH),
4BPU, 4CAF, 4CCX, (4CKO), 4CWH, (4SE), 4SP,
4VY, 4XE, 4AXF, 4CBA, 4CBH, 4EI.

1BJS, Damariscotta Mills, Maine

Spark: 1AA, 1CE, 1CK, 1DY, (1FM), 1FS,
(1LZ), 1MA, 1OR, (1ACO), 1AED, 1AIR, 1BCF,
(1BDV), 1BOE, (1BPZ), 1BRI, (1BRQ), 1BUB,
1BVB, 1BZN, 1CED, (1CGU), (1CHJ), 1CSS, 2DN,
2EL, 2FP, 2KK, 2NF, 2OM, 2PF, 2RM, 2ACW,
2AWF, 2ARR, 2BYS, 3BFU, 4XE, Canadian (2AS).
C.W.: 1DH, 1DY, 1GV, 1HK, 1HX, 1KC, 1PO,
1RD, (1UL), 1VQ, 1XM, 1XX, 1ZE, 1ACS, 1ACU,
1ADL, 1AGI, 1AHS, 1AJU, 1ANQ, 1ASF, 1AWB,
1AWD, 1AZD, 1AZW, 1BCF, 1BDI, (1BDV), 1BEA,
1BES, 1BGF, 1BHR, 1BID, 1BKA fone, 1BQE,
1CBP, 1CCZ & fone, 1CFI, 1CHJ, 1CLZ, 1CMP,
1CNE, 1CNR, 1CPN, 1CXC, 2BG, 2HJ, 2KL, 2NQ,
2NZ, 2SQ, 2WR, 2ZL, 2AJA, 2AWF, 2AWH, 2AWS,
2AXC, (2BIO), 2BML, 2BNZ, 2BQU, 2BRC, 2BUM,
2CBT, 3CM, 3FS, 3OD, 3OT, 3XA, 3XW fone,
3ZZ, 3ACK, 3AJD, 3CBM, 3OV, 3QZ, 3SP, 3VY.

8XE, 8ACF, 8AGO, 8AOL, 8APT, 8AVL, 8BRL, 8CKO.

2BQU, Staten Island, N. Y. C. (1 Tube)

C.W.: 1AR, 1ES, (1GV), 1HK, (1IV), 1KC, 1MX, (1OZ), 1PR, 1PT, (1QN), (1QP), 1SC, (1UL), (1VQ), (1XM), (1XX), 1YK, (1ACU), 1AGH, (1AGI), 1ASF, 1AST, (1AWB), (1AYQ), (1AYZ), (1AZW), 1BAS, (1BDV), (1BES), 1BKP, (1BKQ), 1BQT, (1BWJ), (1CCZ), 1CGZ, (1CHJ), 1CIC, 1CIK, 1CIZ, (1CJA), 1CMK, 1CNE, 1CNR, (1CPN), (1CQW), 1CKB, 2ANM, 8AS, (8BZ), 3CC, 3FS, 8GK, (8IW), 8LR, 8LP, 8OD, (8OT), 8PB, 8QV, 8TA, (8TJ), (8VW), 8WF, 8XA, 8ADX, (8AFB), 8AJD, 8AJH, 8ALN, (8ANJ), 8AUW, (8AWH), 8BGT, 8BIT, 8BLJ, 8BJY, 8BLF, 8BQT, 8BRW, 8BTY, 8BUP, (8CAN), 8CBK, 8CBM, (8BX), 8BY, 8DC, 8GL, 8LP, 8MW, 8XX, 8FV, (8AN), 8CK, 8DV, 8EA, 8HH, (8HJ), 8JU, 8KG, 8KH, 8OW, 8QB, 8TB, 8UC, 8UE, 8VQ, 8XE, 8XV, 8ACF, 8AFD, 8AIO, 8AJT, 8AMD, 8AMQ, 8AOB, 8AQF, 8AQO, (8AQZ), 8ARI, 8AUA, 8AVL, 8AWM, 8AWP, 8BAS, 8BAZ, 8BBD, 8BDB, 8BEF, 8BIL, 8BKE, 8BOH, 8BPU, 8BQU, 8BRW, (8BVM), 8BVT, 8BXH, 8BXT, 8BZM, 8CAZ, (8CFP), 8CKM, (8CKO), 8CJO, 8CJS, 8CJY, 8CLJ, 8CML, (8CON), 8ZAC, 9EI, 9PA, 9UH, 9UU, 97N, 9AAW, 9AJH, 9AIX, 9AJA, 9AON, (9APS), 9AXF, 9CBA: Canadians (8JI), (9AL).

Spark: 1DY, 1CHQ, 8ABB, 8AJD, 8BEY, 8EW, 8RQ, 8UC, 8AVJ, 9DZY, Canadian 8GX.

2BIR, Nutley, N. J.

C.W.: 1ACS, (1ACU), 1AKG, 1ANT, 1ARY, 1AWB, (1AZD), 1AZW, (1BAS), 1BEC, 1BKQ, 1BQE, 1CAK, 1CHJ, 1DY, 1ES, 1FM, 1GV, 1HK, 1HX, (1ON), 1PT, (1VQ), 1VT, (1XM), 1YK, (2ANM), 2AWS, 2BKT, (8ADX), 8AFB, 8AJD, (8ALN), 8ANJ, 8AUU, 8AWH, 8BGT, 8BJJ, 8BIT, 8BLF, (8BNU), (8BVC), 8CBM, 8CQU, 8DT, 8EM, 8FS, (8IW), 8LP, 8LR, (8MK), 8OD, 8OT, 8QI, 8VW, 8ZM, (8ZO), 8ZZ, 4BX, 4DC, 4HW, 4MW, 5FV, 8AFD, 8ALF, 8ALV, 8AMD, 8AMQ, 8APH, 8AQV, 8AQZ, 8ASM, 8ASZ, 8ATU, 8AUX, 8AVD, 8AVJ, 8AVL, (8AWP), 8AWT, 8AXB, 8AXK, 8BBD, (8BDB), 8BEF, 8BEO, 8BFM, 8BFZ, (8BIL), 8BJS, 8BMM, 8BPL, 8BPR, 8BRC, 8BRQ, (8BRT), (8BTR), 8BVT, 8BWZ, 8BZF, 8CBJ, (8CCX), 8CEI, (8CGN), 8CJH, 8CJL, 8CJS, 8CJY, 8CKK, 8CKO, 8CNT, 8CON, 8CPX, (8CTN), 8AX, 8AN, 8BO, 8BZ, (8DV), 8EA, 8KG, 8KH, 8KU, 8PT, 8QB, 8SE, 8SP, (8TG), 8UC, 8XE, 8Z, 9AJH, 9APS, 9AXF, 9BHD, 9BLC, 9BSG, (9CBA), 9DR, 9EI, (9IO), 9NX, (9UH), 9XL, Canadians 3BP, 3BV, (3JI), (3JK).

Spark: 1AMQ, (1CDM), 1LZ, 3AHK, 8AYM, 8BDA, 8BRL, 8EB, 8EW, 8IL, 8TC, 8TK, 8WZ, 8ZO, 9AAW, 9DCX, 9DYZ, 9AM, 9UH, 92N.

2AFP, Paterson, N. J. (All C.W.)

(1ACU), 1ADL, 1AIP, 1AJL, 1AKG, 1AR, 1ARY, 1ASF, 1AUN, 1AWB, 1AWO, 1AZD, 1AZW, (1BAS), 1BBW, 1BDI, 1BES, 1BEN, 1BKP, (1BKQ), 1BNT, 1BWJ, 1CBH, 1CCZ, 1CGQ, 1CHJ, 1CIK, (1CK), 1CNE, 1CPN, 1CQW, 1CRF, 1EE, (1HX), (1II), 1IX, (1ON), 1PM, 1QN, 1PT, (1RD), (1VQ), (1XG-fone), (1XM), (1XX), 8ADT, 3AFB, (3AGC), 3AIS, 8AQH, 8AUW, 8AWH, (8BGT), 3ANO, 3ANS, 3AQH, 8AUW, 8AWH, (8BGT), 3BHL, 3BJJ, 8BIT, 8BJY, (3BLF), 3BNF, 3BNU, 3BG, 3BTY, 3BUR, 3BUV, 3BV, 3BZ, 3CBM, 3CC, 3CCC, (3CG), 3DM, 3EM, (3FS), 3IL, (3IW), 3MK, (3OT), 3PB, 3QV, 3RV, (8TJ), (3VW), 3XAW, 3XW-fone, 3ZO-fone, 4BQ, (4BX), 4CO, (4DC), (4DL), (4GX), (4LP), 5AAM, 5DA, 5FV, 5WO, (8ABO), (8ACF), (8ADR), 8AFD, 8AFI, (8AGO-fone), 8ALB, 8ALD, 8AMD, (8AMM), (8AMQ), 8ANB, 8ANE, (8AQF), (8AQZ), 8ARD, 8AUX, 8AUU, 8AVD, 8AVL, 8AWT, (8AWM), (8AXB), 8AXC, 8AXH, 8AXK, 8BDU, 8BEK, (8BEO), (8BLX), 8BNU, (8BO), 8BPU, 8BRC, 8BRT, 8BRW, 8BRZ, (8BUQ), 8BUX, 8BXA, 8CAY, 8CAZ, 8CBI, (8CGN), 8CID, (8CJH), 8CJY, (8CKM), 8CLJ, 8CLP, 8CMM, 8CNB, 8COI, 8CON, 8CPX, 8CQL, 8CTN, (8CUU), 8CWW, (8DV), 8HM, (8JL), 8JS, (8KH), 8LB, 8PN, (8PT), 8QY, 8RW, (8SE), 8SZ, 8TO, (8TG), (8UC), (8UE), 8UK, (8VY), 8WA, (8XE), (8XG), 8XH, 8ZAE, 8ZK, 8ZN, 8ZZ, 9AAP, 9AEU, 9AIX, 9AJA, 9AJH, 9APH, 9ARK, 9AXF, (9BCT), 9BLC, 9BLD, 9CBA,

9DGQ, 9DR, 9EI, 9HW, 9II, 9IO, (9UH), 9UU, 92N, Can. (8BP), (8GX), (8JI), 3JK, (9AL), Dalite: (1ACU), 1AWB, 1CGQ, (1ON), (1VQ), 3ANS, 8AWH, 8BJJ, (8BNO), (8OT).

3ZO, Parkesburg, Pa. (All worked on C.W.)

1HX, 1BAS, 1BKQ, 1CHJ, 2BG, 2NZ, 2SQ, 2ANM, 2BIR, 2CBG, 2CES, 3DM, 3FS, 3GX, 3LP, 3OT, 3QV, 3SJ, 3ZS, 3AAO, 8ADX, 8ALN, 8ANJ, 8AQG, 8AUV, 8BEY, 8BIJ, 8BIT, 8BJJ, 8BNE, 8BNU, 8BTY, 8BVA, 8HJ, 8XE, 8XJ, 8ZO, 8ZZ, 8AQV, 8AQZ, 8ASZ, 8AWP, 8BRT, 8CLD, 9EI, Can. 9AL.

During Daylight Transcons—Spark: 3BO, (8GX), (8II), (8QN), (8QW), 8ABB, (8AWE), 8BEC, 8BEI, (8BSL), 8BTY, C.W.: 2NZ, 2TS, 2UD, 2WB, 2AFP, 2AMF, 2AWS, 2AZC, 2BEH, 2BTJ, (8BG), 8CG, 8CC, 8CM, (8FR), (8FS), (8GC), 3JI, (3LP), 3OT, 3QP, 3AAO, (8AAY), 8ABW, (8ADX), 8AGC, 8AIK, 8AJB, 8AJD, 8ALJ, 8ANJ, 8AOD, 8APD, 8ASP, 8AUW, (8AWH), 8BEF, 8BFC, (8BIT), 8BJI, 8BJP, 8BJY, 8BRW, 8BTY, 8BUV, 8CAN, (8CBM), 8CCC, 8QZ, (8XE), 8AVL.

3BIT, Lancaster, Pa. (All C.W.)

(1EE), 1IV, 1XM, (1AGH), (1AGI), (1ANQ), (1AWB), (1BKQ), 1CCZ, (1CHJ), (1CMK), (2HW), (2KL), 2NZ, (2RY), (2BEH), (2BJO), (2BLP), (2BNZ), (2CEG), (8BZ), (8CC), (8DM-fone), 3MK, (8OT), (8XW-fone), (8ZO), (3AAO), (8AAY), 8AFB, (8AIS), (8AJD), (8ANJ), 8ATZ, 3BBN, (8BIJ), (8BNU), (8BVA), (8CBM), (8CBP-fone), (4DC), 4GL, 4GX, 5LL, 5ZA, 6XAD, 8HP, 8LF, (8SP), (8XE-dalite), 8ZZ, 8ADG, 8ANB, 8BDB, (8BEF), (8BPL), (8BRC), (8BXH), 8BXT, (8BZF), 8CJH, 8CJY, 8CGX, (9UU), (9APS), 9AIX, 9AZA.

3RB, Philadelphia, Pa.

Spark: 2OM, 8AIB, 8BDA, 8EW, 8RQ, 9AAW, C.W.: 1AAO, 1AGH, 1AGI, 1AJU, 1AWB, 1AZW, 1BCF, 1BES, 1BGF, 1BHJ, 1BKQ, 1BQE, 1CAK, 1CCZ, 1CHJ, 1CMK, 1GV, 1HX, 1PT, 1KM, 1XX, 2ACD, 2AFP, 2AWF, 2AXK, 2BEH, 2BFZ, 2BG, 2BJO, 2BKT, 2BML, 2BNZ, 2BQV, 2BRB, 2BRC, 2BUF, 2BUM, 2CBT, 2CF, 2CHE, 2CNK, 2CNZ, 2FP, 2IG, 2KL, 2NZ, 2OE, 2UD, 3AAO, 3AEV, 3AFB, 3AIS, 3AJD, 3AJV, 3ALN, 3APD, 3AS, 3BHL, 3BIJ, 3BIT, 3BLF, 3BLP, 3BNU, 3BUV, 3CBM, 3CG, 3MK, 3MO, 3WF, 3ZO, 3ZZ, 4BX, 4DC, 4GS, 4MW, 5FV, 5SP, 8ACF, 8AFD, 8AHC, 8AHR, 8ALB, 8AMM, 8AMQ, 8AN, 8APH, 8APT, 8AQO, 8AQV, 8ASM, 8ASZ, 8AVD, 8AVL, 8AWM, 8AWP, 8AXB, 8BAL, 8BBD, 8BDB, 8BDU, 8BEF, 8BIL, 8BO, 8BOG, 8BPH, 8BQU, 8BRC, 8BRL, 8BRW, 8BXH, 8BZF, 8CAZ, 8CBJ, 8CEI, 8CFP, 8CGX, 8CJH, 8CJY, 8CKO, 8CNW, 8CON, 8CPX, 8DV, 8GA, 8HJ, 8JU, 8KG, 8KS, 8OW, 8PT, 8SE, 8SP, 8UC, 8UE, 8UK, 8UZ, 8VQ, 8WR, 8XE, 8XY, 8YD, 8ZA, 8ZZ, 9AJA, 9AJF, 9ARK, 9DR, 9EI, 9HW, 9IO, 9UU, Canadians, 3BV, 3KO 9AL.

3GX, Reading, Pa.

Spark: (1AKG), 1BHJ, 1BOE, 1BPZ, 1CEK, 1CHQ, (1HO), 1SC, 1SN, (2ACW), 2AWF, (2BJO), 2EL, 2FP, (2OM), 2UE, 3ACK, (3ACY), 3AHE, 3ASO, 3BPO, 3DY, 3FP, 3HJ, (8OK), (8QN), 3XC, 3ZS, 4BI, 4FD, 4IE, 8ACZ, 8AIB, 8AIX, 8AJZ, 8AJT, 8ANW, 8AVX, 8AVJ, 8AWX, 8AYM, 8AZF, 8BAF, 8BDA, 8BQA, 8BUN, 8BUY, (8CDI), 8EB, (8EW), 8MU, 8OI, 8RC, 8TC, 8TS, 8UC, 8VE, 8VH, 8XXV, 8ZO, 9AAW, 9AGR, 9APS, 9DHz, 9DX, 9EF, 9KI, 9UH, Can. 9BS.

C.W.: 1AFZ, 1AUN, 1AWB, 1PY, 1XM, 1BQT, 1CQW, 1HX, 2ANM, 2AWF, 2BG, 2BJO, (2BML), 2CBQ, 2FP, 2JW, 2NZ, (3AAO), 3AAV, 3ALN, 3ANJ, (3AWH), 3BLH, 3BTY, 3BUP, 3BVA, 3BVC, 3BZ, (3CC), 3FS, 3GC, 3GK, 3HD, 3IW, 3JK, 3MK, 3OA, 3OT, 3QV, 3VW, (3ZO), 4BX, 4DC, 8AFD, 8AIO, 8AMD, 8AQO, 8AQV, 8ATU, 8AWM, 8BDU, 8BEO, 8BPL, 8BRW, 8BSJ, 8BXH, 8CAY, 8CBJ, 8GO, 8KH, 8OW, 8SE, 8SP, 8UE, 8XE (daylight), 8ZAF, 8ZQ, 8ZZ (fone), 9IO.

4HZ, South Jacksonville, Fla.

Spark: 4BI, 4BW, 4FD, 4HS, 4IE, 8OI, 9DZY, 9AAP, 9DCX, 9UH.

C.W.: 1IV, 2AFP, 2BRB, 2BT, 2FP, 2KL, 2NZ, 3AFD, 3ALN, 3AUU, 3BG, 3BIJ, 3BLF, 3BMN, 3CBM, 3PD, 3KM, 3LR, 3ZZ, 4BX, 4BZ, 4DC, 4EN, 4GS, 4GV, 4KP, 4KU, 5DA, 5FV, 5UK,

8ACF, 8ALB, 8AMP, 8AWN, 8BFH, 8BK, 8BO, 8BOP, 8BRM, 8BVT, 8CFP, 8CKO, 8JU, 8KG, 8KP, 8SP, 8UE, 8XE, 8YE, 8ZAF, 8ZZ, 9AIX, 9CBA, 9DCR, 9EI, 9UU.

4BX, Wilmington, N. C.

C.W.: 1GV, 1HK, 1QN, (1QP), 1XM, 1XX, (1ACU), 1AGL, 1BGF, 1BKQ, 1BQE, (1BQT), 1BWJ, (1CCZ), 1CHJ, 1CMK, 1CNJ, 1CNR, 1CPN, 1CTK, 1XAE, (2BG), 2FP, 2FZ, (2KL), 2ND, 2NK, (2NZ), 2QV, 2RY, (2SQ), 2TS, 2UD, 2AER, 2AFP, 2AWF, (2AWS), 2AZC, 2BEH, 2BGL, 2BJO, 2BML, 2BNZ, 2BOX, 2BQH, (2BQU), (2BRB), (2BRC), 2CES, 2CNK, (2COL), 2XAJ, 2AS, 2BG, (2BZ), 3CC, 3CR, (3FS), 3GH, 3HL, 3IP, (3IW), 3LP, 3LR, (3MK), (3OT), 3QV, (3TA), (3TJ), (3VW), (3ZZ), 3ABX, 3AFB, 3AJD, (3ALN), 3ALR, (3ANO), (3AOU), 3AUW, (3AWH), (3BEL), (3BLJ), 3BIT, 3BJY, (3BLF), (3BMN), (3BNU), 3BUC, (3CBM), 3CBO, 3CJY, 4BL, (4DC), (4DL), 4DS, 4DQ, 4EI, (4EN), 4GH, 4GL, (4GX), 4HW, (4ID), 4KC, 4KF, (4LP), (4MW), 4LZ, 4DA, (4FV), 5UC, 5UK, 8AM, (HJ), 8JU, 8KG, 8LB, 8OW, (8PT), 8QB, (8SP), 8TC, 8UE, 8UC, 8VQ, (8XE), 8ZO, 8ZN, 8ZX, 8ZZ, 8ACF, 8ACP, (8AFD), 8AIO, (8AMD), (8AMM), 8AOS, 8AQO, 8ASD, 8ASZ, (8AVD), (8AVL), 8AWM, 8AWP, 8AWZ, 8BDA, (8BDB), 8BDH, (8BDU), 8BFM, (8BFX), 8BIZ, 8BOG, 8BPL, 8BPU, 8BRM, 8CAY, 8CAZ, (8CBJ), 8CCX, 8CEI, 8CFP, 8CJY, 8CKM, (8CKO), 8IQN, 8ZAE, (8ZAF), 9EI, 9OX, 9UH, 9UU, 9AIX, 9APS, 9AON, 9AXF, 9BDG, (9BHD), 9BLN, 9CBA.

Spark: 2EL, 2FP, 2NZ, 2OM, 3BEI, 3BVC, 4BI, 4FD, 4GN, 4HS, 4IE, 9AMT, 9DHz, Can. 3BV, 9AL.

5TC, Box 1557, Fort Worth, Texas

Spark: 5AG, 5ABY, 5GK, 5HZ, 5MK, 5NC, 5PE, 5QA, 5QU, 5TG, 5TP, 5TU, 5VE, 5WU, 5XAC, 5ZAE, 5ZAF, 5ZAV, 5ZO, 9APK, 9AQE, 9DDZ, 9DSD, 9KI, 9UU, 9ZV, 9ZUT.

C.W.: 4BQ, 4EL, 4ER, 4FL, 4MW, 5AE, 5AAE, 5BA, 5DO, 5FV, 5IR, 5JL, 5KB, 5LA, 5MA, 5OI, 5QS, 5SP, 5UK, 5UU, 5UO, 5VA, 5ZAT, 6KA, 6BES, 6ZF, 7ZU, 8VR, 9ACU, 9AEY, 9AIX, 9AOG, 9AON, 9AOX, 9BSG, 9CCV, 9DUN, 9NX, 9OX.

5GP, Anniston, Ala.

Spark: 4IE, (5BP), (5ON), 5SM, 5TU, (5VV), 8UC, 8ZO, 9ACB, 9DZY, 9KI, 9LF, 9OX.

C.W.: 2FP, 3BLF, 3BV, 4CR, 4DC, 4EB, 4GH, 4GU, 4HW, 4ID, 4IV, 4IW, 4KF, 4LP, 4MW, 5AAM, 5AAB, 5AE, 5DO, 5EK, 5FO, 5FV, 5IR, 5KC, 5LA, 5LJ, 5MA, 5NM, 5NS, 5NV, 5SP, 5UK, 5VA, 5ZAS, 5ZG, 8AMD, 8BDU, 8BFX, 8BXH, 8BZF, 8CGX, 8DAK, 8GV, 8KH, 8SP, 8UC, 8UZ, 8XE, 8XJ, 8ZZ, 9AAP, 9AGR, 9AIX, 9AJG, 9AOG, 9AON, 9APS, 9AQJ, 9ARK, 9ATA, 9AXB, 9AXF, 9BAK, 9BCT, 9BDB, 9BBL, 9BRS, 9BSG, 9CCS, 9DKH, 9DXN, 9DZ, 9EI, 9NX, 9WA, 9YA, 9YE.

5TU, Box 356, Commerce, Texas

Spark: (5ABY), (5AE), (5AEJ), (5AET), (5ACQ), (5AG), (5AL), (5FI), (5FZ), (5GK), (5HZ), (5IC), (5IR), (5JI), (5MK), (5NC), (5NI), (5NS), (5NU), (5OI), (5PE), (5QA), (5QI), (5RB), (5SO), (5TC), (5TI), (5TP), (5UD), (5VA), 5XAC, 5ZA, 5ZAF, (5ZAV), (5ZAW), (5ZC), 8UC, (9ABV), (9AQE), (9DZY), 9LF, 9HT, (9ZV).

C.W.: (5AE), (5BO), (5DI), 5DO, (5DY), 5EK, (5FV), 5IR, (5JB), 5KC, 5MA, (5NS), (5UK), (5UN), (5TH), (5VA), 5ZA, (5ZG), 6KA, 8UC, 8ZZ, (9ABV), (9AOG), 9BSG, (9CCS), 9DUG, (9DUN), 9NX.

5DO, Memphis, Tenn.

C.W.: 2FP, 2NZ, 3ALN, 3BLF, 3BZ, 3HL, Can. 3KO, 4AZ, 4BX, 4DC, 4DG, 4FW, 4HW, 4JH, 4KC, 4KF, 4LP, 4MW, 5AAM, 5ACF, 5DI, 5FO, (5FV), 5GK, 5HI, (5IR), 5JB, 5JL, (5KC), 5LA, 5LK, 5MA, 5NM, 5PB, 5PL, 5SP, 5UE, (5UK), 5UO, (5VA), (5XY), 5ZA, 5ZAS, 5AFT, 8AN, (8ANB), 8AP, 8APT, 8ASZ, 8AUA, 8AWM, 8AWT, (8AXB), 8BAK, 8BDB, 8BDU, 8BFM, 8BFX, 8BKE, 8BNU, 8BRM, 8BRQ, 8BZI, 8CAZ, 8CGX, 8CKO, 8KH, 8SP, 8UC, 8VQ, (8VY), 8XE, 8XY, 9AAP, 9ABV, 9ACP, 9AEF, 9AIX, 9AJA, 9AJF, 9AMI, (9AOG), (9AON), 9APS, 9ARB, 9ARK, (9AUS), 9AXF, (9BDB), 9BED, 9BHL.

9BOG, 9BQW, (9BSG), 9CAY, 9CBA, 9CFI, 9DAK, 9DFM, 9DR, 9DSG, (9DUN), 9DUG, 9DWK, 9DXN, 9HW, (9IO), 9KP, 9LQ, (9NX), 9OX, 9PA, 9UU, 9XE, 9XL, 9YAJ.

Spark: 4BI, 4FD, 5TU, 5XAC, 9CP, 9DZY, 9KI, 9LF, 9YM.

6FH, Sacramento, Cal.

Spark: (6AO), (6AR), (6AAU), 6ACR, 6AEQ, 6AIU, 6AJH, 6AKI, (6AKT), 6ALA, 6ALD, 6ALU, 6ALW, (6AMK), (6AMZ), (6AQU), (6ARK), 6AWH, 6AUP, (6AVD), (6AVR), 6BH, 6BML, 6BJU, (6CC), (6DP), 6EA, (6GT), (6HC), (6IB), 6KE, (6MH), 6OD, (6OL), 6QY, (6TC), 6TU, 6UP, 6VX, 6ZU, 7BK, 7FI, (7KJ), 7NN, (7NW), (7TJ), 7TO, 7TW, (7VF), (7AEA), Canadian 9BD.

C.W.: 6ALU, (6ASJ), 6AWP, (6AWT), (6BF), (6BCD), 6BEG, 6BES, 6BFE, 6BJC, 6BKB, 6BMD, (6BQC), 6BQK, 6BSA, (6CU), 6DR, (6EA), (6EB), 6EN, (6FT), (6GY), 6JD, 6KA, 6LV, 6NX, 6OO, 6RR, 6TI, 6ZF, 7LU, 7OZ, (7SC).

6AWP, 407 West First St, Santa Ana, Calif.

C.W.: (5ZA), 6AIF, 6AIY, (6AK), (6AKW), 6AOT, (6ASJ), (6ATP), (6AUN), (6AWT), (6BJD), (6BKB), (6BPU), 6BQF, 6BSA, 6DF, 6EK, (6FH), 6GH, 6IB, (6KC), 6KH, (6LU), 6NN, 6OV, 6PI, (6TI), (6TW), 6XAS, 6XH, (6ZA), 6ZAA, 6ZAC, 6ZAE, (6ZAF), (6ZF), 6ZG, (6ZN), 6ZI, (6ZT), 6ZX, (6ZZ), (7DP), 7NF, 7NA, 7NI, (7MF), (7OZ), 7SC, 7XG, 7XF, (7ZU), (9AYU), 9WD, (9WU), (CL-8), Can. 9BD.

Spark: (6AAK), 6AAU, (6ABU), (6AEH), 6AGT, (6AHF), (6AJH), 6AJR, (6AKL), 6AMZ, 6AR, 6AS, (YATU), 6BDQ, (6BJU), (6BJY), 6BJV, 6CC, 6CS, 6GR, 6GX, 6HC, (6IC), 6IU, (6KC), (6VK), 6VX, 6ZAM, (6ZB), 6ZQ, (6ZU), 6ZX, (6ZZ), 7KB, (7LY), (7MF), 7MP, 7NF, (7OT), 7TJ, (7ZU).

6OD, South Pasadena, Calif.

Spark: 5IF, 5OF, (6ZA), (6AK), (6AR), (6AS), 6BM, (6BW), 6CC, 6CP, 6CV, (6DP), (6EX), (6FH), 6FJ, (6FK), (6GF), (6GR), (6GT), (6GX), (6HC), (6HP), (6IB), (6IC), (6IM), (6KC), (6KM), (6KX), (6LU), (6MZ), (6NG), (6OC), (6OH), (6PJ), (6PO), (6PR), (6QK), (6QR), 6QY, (6TO), (6TU), (6TV), (6VK), (6VX), (6WG), (6WZ), (6XH), (6ZB), 6ZD, 6ZE, (6ZI), (6ZJ), (6ZK), (6ZU), (6ZX), (6ZZ), (6AAH), (6AAK), (6AAU), 6AAW, 6ABM, (6ABU), (6ABW), (6ABX), 6ACM, (6ACR), 6ACW, (6ADA), (6AEH), 6AEI, (6AFP), 6AEY, (6AGF), (6AHF), (6AIF), (6AIN), 6AJD, (6AJH), (6AJR), (6AKL), 6AKT, (6ALA), 6ALV, (6AMK), 6AMW, 6ANG, (6ANI), (6AOE), (6AOR), 6APE, (6AQU), 6AQY, 6ARK, (6ARS), (6ARW), 6ASN, (6ATU), (6AUD), (6AVB), (6AVM), (6AVV), 6AVZ, 6BAK, 6BCJ, (6BGL), (6BIU), (6BJV), 7BK, 7BP, 7BH, 7FI, (7FJ), 7GA, 7GJ, 7GQ, 7HF, 7IN, 7IY, (7MF), 7JD, (7OT), 7TJ, 7XD, 7YA, 7ZJ, 7ZT.

C.W.: 5ZA, (6AK), 6FH, (6GF), 6HC, (6JJ), 6KU, 6OO, 6ZB, 6OH, (6ZI), 6ZS, 6ZX, 6AAT, 6AEH, 6ASJ, 6ASV, 6AWT, (6ATP), 6BJY, 6BMD, 7MF, 7XF, 9DN, 9WD, 9AMB, 9AYU, 9BJI, 9DVA.

7NW, Hoquiam, Wash.

Spark: (6ABX), 6ABW, 6ACR, 6ALA, (6AMK), 6ANG, 6ARK, (6AVM), (6CC), (6DD), (6EX), 6FF, (6GF), (6IB), 6IC, 6TU, (7AEA), 7BH, (7BK), 7BZ, (7EX), 7FH, (7FI), (7GE), 7HF, (7IW), (7IY), (7KE), 7KZ, 7MF, 7OF, 7OW, (7TO), (7TW), (7VE), 7VF, 7WG, 7ZK, (8EC), Can. 5CT, (9BD).

C.W.: 6AAT, 6ABX, 6BCD, 6GR, 6KA, 6RM, 7AEA, 7DD, 7LU, (7MF), 7NA, (7OZ), (7QW).

7TH, Walla, Walla, Wash.

Spark: 6GF, 6GI, 6HC, 6ABU, 6ACR, 6AMZ, 6ARK, 7BK, 7GE, (7JW), 7NW, 7OF, 7RA, 7TO, 7UW, 7VL, (7VF), (7ABY), (7AEA), (CL8), Can. 9BD.

C.W.: 6EN, 6FF, 6FT, 6KA, 6AWT, 6BSA, 7IA, 7LU, (7NA), 7QW, 7RN, 7ZU, Fones: 7IA, 7RN, 7XF, 7ZU.

7GE, Pasco, Wash. (1 Tube)

Spark: 6CC, (6EX), (6GR), 6IB, 6LC, 6LG, 6NN, 6RM, (6TU), (6AJR), 6AQU, 6AMK, 6BAK,

6ALD, 6ABU, 6AAU, 6AGF, 6ABX, 7AW, 7AX, 7BG, 7BE, 7BK, 7BZ, 7CU, 7EO, 7EX, 7FI, 7FQ, 7FR, 7GA, 7HD, 7HI, 7IW, 7IV, 7JW, 7KE, 7KJ, 7KM, 7NN, 7NW, 7OH, 7OT, 7NL, 7OF, 7EO, 7TO, 7VE, 7VF, 7VZ, 7WG, 7WM, 7YA, 7YS, 7ZK, 7TJ, 7TAA, 7CL, 7CWS, 7SWH, 6FF, 6GF, 6GX, 6GY, 6JD, 6KA very QSA, 6KC, 6KU very QSA, 6LO, 6NX, 6OI, 6PL, 6UO, 6AWT very QSA, 6BES, 6AAT, 6ASJ, 6BCD, 6BMU, 7BS, 7LU very QSA, 7QE, 7QW, 7RN, 7SC, 7BT, 7NA, 9AYU, Can. (5AK), 8EC, (9BD).

SAVJ, Canajoharie, N. Y.

Spark: 1AA, 1ADC, 1AMQ, 1AW, 1BJS, 1BOE, (1BPZ), 1BRQ, 1CE, 1CHQ, 1DY, (1FS), 1LQ, 1SN, 2ACW, (2ARB), 2AWF, 2BQZ, (2CGJ), (2DN), 2EL, 2FP, (2OM), 3AHR, 3AWE, 3BEI, 3BEU, 3BP, 3BSE, 3BH, 3HJ, 3IL, 3APV, 3AJT, (3AOI), (3AOT), 3APB, (3APU), 3AXX, 3BAC, 3BAH, (3BCW), 3BDA, 3BJS, (3BLH), 3BUN, 3BYP, 3BZ, 3CJH, 3EJ, 3IL, 3KY, 3MU, 3RQ, 3UC, 3UE, 3VE, 3VQ, 3XE, 3ZO, 3AAW, 3AFS, 3BS, 3LF.

C.W.: 1ADC, 1ADL, 1AGH, 1AGP, 1AJU, 1ANQ, 1AQW, 1ARY, 1AWB, 1AZD, 1AZW, 1AZX, 1BCF, 1BES, 1BGF, 1BKA fone, 1BKQ, 1BNT, 1BWJ, 1CAE, 1CBH, 1CBP, 1CCZ, 1CFL, 1CGR, 1CHJ, 1CHK, 1CJH, 1CMK, 1CNK, 1CNM, 1CNR, 1CPN, 1CQW, 1HK, 1PY, 1RN, 1SC, 1XX, 1YK, 2ANM, 2ATR, 2AWF, 2AWH, 2BAA, 2BEH, (2BIG), (2BML), 2BQH fone, 2BQU, 2BRC, 2COS, 2FP, 2KL, 2RY, 3AAO, 3AFB, 3ANT, 3AJL, 3AUT, 3AWS, 3BG, 3BLF, 3BNU, 3BRW, 3BTY, 3BVC, 3CBM, 3CLL, 3HL, 3HY, 3IW, 3LR, 3OT, 3PS, 3RW, 3VJ, 3VW, 3ZM, 3ZO, 3ACF, 3AFD, 3APE, 3APT, 3AQO, 3AYD, 3AVL, 3AWP fone, 3AZF, 3BEO, 3BFX, 3BJH, 3BNU, 3BRQ, 3BRW, 3CAZ, 3CBJ, 3CCX, 3CIO, (3CIV), 3CJH, 3CJY, 3CKO, 3CNW, (3CPG), 3CUK, 3HJ, 3JU, 3SP, (3TB), 3XE.

8BCW, Gen. Delivery, Rome, N. Y.

Spark: 1DY, 1HO, 1LZ, 1OE, 1ACO, 1AKG, 1BPZ, 1BRQ, 2DN, 2EL, 2FP, 2JG, 2OM, 2RM, 2TJ, 2AHU, 2ARB, 2BJO, 3CN, 3FP, 3GX, 3IN, 3QN, 3ACY, 3AHK, 3AWE, 3EO, 3EW, 3HL, 3RQ, 3TC, 3UC, 3ACF, 3AHU, 3AIB, 3APB, 3AVJ, 3AXX, 3BAC, 3BDA, 3BQT, 3BZU, 3UH.

C.W.: 1GV, 1QN, 1PT, 1SC, 1XM, 1XX, 1YK, 1ACS, 1ACU, 1AGH, 1AGI, 1AJU, 1AWB, 1BKQ, 1BWJ, 1CBH, 1CDO, 1CMK, 1CPN, 2BG, 2DA, 2FF, 2JW, 2NZ, 2OT, 2TS, 2UD, 2AFP, 2AGH, 2AQF, 2AWH, 2AWS, 2AYG, 2AYV, 2BAA, 2BEH, 2BFZ, 2BQZ, 2BJO, 2BLP, 2BML, 2BNZ, 2BQH, 2BQU, 2BRB, 2BUM, 2CBG, 2CBT, 2CKL, 2CMS, 2COL, 2BFI, 3BV, 3BX, 3CC, 3IW, 3OT, 3ZO, 3ZZ, 3AFB, 3ANJ, 3ANO, 3BIT, 3BNU, 3BTY, 3BVC, 3CBM, 3CCO, 4BX, 4XX, 8AX, 8HJ, 8KG, 8OW, 8SE, 8SP, 8UK, 8XE, 8AQF, 8AVL, 8AWM, 8BDO, 8BDU, 8BNU, 8BNY, 8BPH, 8BPL, 8BRC, 8BUT, 8BXH, 8CBJ, 8CBO, 8CJH, 8CKO, 8CON, 8CPC, 9ARK.

8BHF, Fairport, N. Y.

C.W.: 1ARY, 1BKQ, 1CAZ, 1CHJ, 1CNR, 1HX, 1VQ, 1XM, 2AER, 2AFP, 2AJA, 2BEH, 2BQH, 2BQU, 2BRB, 2COL, 2FP, 2KL, 2OT, 2SQ, 3ADZ, 3AFB, 3AIS, 3ALN, 3ANJ, 3ANO, 3APD, 3BLJ, 3BIT, 3BLF, 3BNU, 3BRW, 3CBM, 3CC, 3DT, 3KO, 3OT, 3ZO, 3ZZ, 3ACF, 3AHK, 3AIO, 3ALB, 3ALF, 3ALV, 3AMM, 3AMQ, 3AN, 3AOL, 3APT, 3AQZ, 3AVD, 3AWM, 3BDU, 3BEO, 3BMM, 3BNU, 3BO, 3BOA, 3BPH, 3BRM, 3BUX, 3CAY, 3CAZ, 3CCX, 3CEI, 3CFP, 3CGQ, 3CJH, 3CJY, 3CKO, 3COI, 3CON, 3COO, 3HJ, 3KG, 3KH, 3LZ, 3OW, 3QB, 3SE, 3SP, 3UC, 3XE, 3ZAF, (QRA?), 8ZX, 8ZZ, 9AIU, 9APS, 9BDB, 9BSG, 9HW, 9IO.

Spark: 1SN, 2ARB, 2BJO, 2NF, 2OM, 3BEI, 3BU, 3GX, 3QN, 3ALW, 3APB, 3AZF, 3BAH, 3BDA, 3BGT, 3CTZ, 3CUO, 3CYD, 3DAA, 3EA, 3EW, 3IL, 3TC, 3TK, 3VE, 3VH, 3VQ, Phone: 1CIZ, 1CKA, 3XW, 3AQO, 3AWP, 3AZD, 3BOA.

8ZO, 1375 Franklin Ave., Columbus, Ohio

Spark: 1AA, 1AKG, 1AOK, 1ARY, 1AW, 1BDT, 1BEO, 1BRQ, 1BVB, 1CHJ, 1FM, 1GM, 1WQ,

2AAF, 2ARY, 2AWF, 2EH, 2FP, 2OM, 2RM, 2TS, 3ABB, 3AHK, 3AOV, 3BFU, 3BVC, 3CK, 3RW, 3WF, 3WR, 3ZS, 3AO, 4BL, 4CX, 4EZ, 4FD, 4FS, 4GM, 4GN, 4GU, 4HS, 4IE, 4YA, 5ABY, 5ER, 5GK, 5LA, 5MA, 5PE, 5TU, 5XB, 5XJ, 5XU, 5ZAA, 5ZAC, 5ZAF, 5ZAK, 5ZZ, 6TV, 6AAP, 6AOF, 6AER, 6AFK, 6AGF, 6AHY, 6AIB, 6AIT, 6AIZ, 6AJX, 6ALQ, 6ALU, 6ANW, 6ASL, 6ASY, 6ATU, 6AUX, 6AVH, 6AXN, 6AY, 6AYM, 6AZF, 6AZH, 6AZR, 6BAH, 6BAZ, 6BDA, 6BDV, 6BEF, 6BFH, 6BGT, 6BHD, 6BHO, 6BNA, 6BNK, 6BQA, 6BRL, 6BRM, 6BXC, 6BXX, 6CGZ, 6CJZ, 6CKV, 6CMF, 6CMI, 6CMY, 6CP, 6CFF, 6CTD, 6CUO, 6CWB, 6CWD, 6EA, 6EB, 6EO, 6EW, 6KG, 6KJ, 6KY, 6LQ, 6MU, 6NR, 6NZ, 6OL, 6RQ, 6TC, 6TK, 6UC, 6UN, 6VH, 6VQ, 6WD, 6WU, 6WZ, 6XE, 6YR, 6YU, 6ZY, 9AAW, 9ACB, 9AES, 9AFK, 9AGG, 9AGR, 9AIR, 9ALP, 9AMK, 9AMT, 9AMY, 9AOY, 9APK, 9APS, 9ARG, 9AVH, 9AYK, 9AYW, 9AYY, 9AZA, 9BAK, 9BDF, 9BK, 9BRS, 9BIA, 9CP, 9DAY, 9DCX, 9DDZ, 9DGH, 9DHz, 9DI, 9DKY, 9DMJ, 9DPB, 9DSB, 9DTN, 9DWM, 9DWX, 9DZE, 9DXT, 9DZI, 9DZ, 9DZY, 9FK, 9FS, 9GK, 9HR, 9HT, 9JA, 9JK, 9KA, 9KI, 9LF, 9MC, 9ME, 9MS, 9OE, 9OF, 9OR, 9OK, 9QC, 9QI, 9TI, 9UH, 9US, 9VL, 9WX, 9WY, 9XE, 9XI, 9XT, 9YAK, 9YB, 9YM, 9YQ, 9ZH, 9ZJ, 9ZM, 9ZV, 9ZX.

C.W.: 1ACG, 1ACU, 1AJR, 1AJU, 1AR, 1ASF, 1AUZ, 1AWB, 1AZW, 1BDI, 1BGF, 1BKA, 1BKQ, 1BLI, 1BQT, 1CAK, 1CCD, 1CCZ, 1CGQ, 1CHJ, 1CIK, 1CMT, 1CNE, 1CNR, 1CNW, 1CQP, 1CQW, 1CVE, 1GV, 1HK, 1HX, 1ON, 1PM, 1QN, 1QF, 1VT, 1XAD, 1XG, 1XM, 1XX, 1XZ, 1YK, 2AFP, 2AJA, 2ANM, 2APB, 2AWS, 2BDU, 2BEH, 2BEN, 2BFU, 2BFZ, 2BG, 2BIR, 2BIT, 2BLB, 2BLF, 2BNZ, 2BQH, 2BQU, 2BRB, 2BRD, 2BRT, 2BTW, 2CES, 2CIM, 2DN, 2FP, 2KJ, 2LR, 2MJ, 2NZ, 2SQ, 2TS, 2UD, 2VH, 2WB, 2WF, 2XB, 2XM, 3ADZ, 3AJD, 3AL, 3ALF, 3ALN, 3ANJ, 3ANO, 3ARN, 3AUU, 3AUW, 3AXE, 3BFU, 3BG, 3BGT, 3BHL, 3BIA, 3BJJ, 3BJK, 3BLF, 3BMN, 3BNU, 3BQ, 3BRW, 3BVA, 3BVC, 3BZ, 3BZH, 3CBM, 3CC, 3CCC, 3CKM, 3FP, 3HL, 3IL, 3IW, 3JJ, 3JK, 3LR, 3MA, 3OT, 3SY, 3TW, 3VW, 3XW, 3ZO, 3ZZ, 4BX, 4BY, 4DC, 4DF, 4DK, 4DS, 4EB, 4EH, 4GH, 4GL, 4GX, 4HY, 4ID, 4II, 4IV, 4JH, 4KC, 4KF, 4KP, 4LJ, 4LP, 4MT, 4MW, 4QT, 4ZB, 4ZC, 4ZZ, 5AA, 5AAM, 5ABN, 5DA, 5DI, 5DO, 5FO, 5FV, 5JB, 5JL, 5KC, 5LA, 5MB, 5NS, 6NV, 6SO, 6SP, 5UK, 5VA, 5XA, 5XAB, 5XC, 5ZA, 5ZAP, 5ZAT, 5ZAY, 5ZG, 5EN, 6KA, 6TV, 6ZAC, 6ZG, 7KX, 8AAL, 8AAZ, 8ABV, 8ACF, 8ACE, 8AFD, 8AFY, 8AGN, 8AGR, 8AGW, 8AGX, 8AIG, 8AIM, 8AIO, 8AJU, 8AK, 8ALB, 8AM, 8AMD, 8AN, 8ANB, 8AOL, 8AOI, 8AP, 8APT, 8AQ, 8AQF, 8AQO, 8AQV, 8AQZ, 8ARD, 8ARK, 8ASM, 8ASQ, 8ASZ, 8ATU, 8AVD, 8AVH, 8AVK, 8AVM, 8AVT, 8AWH, 8AWP, 8AWT, 8AWX, 8AWZ, 8AX, 8AXB, 8AZH, 8BAS, 8BAZ, 8BDB, 8BDO, 8BDU, 8BEF, 8BEN, 8BEO, 8BEX, 8BFM, 8BFN, 8BFX, 8BHY, 8BIL, 8BKE, 8BKN, 8BL, 8BLT, 8BMM, 8BNO, 8BNU, 8BNY, 8BO, 8BOG, 8BOX, 8BPJ, 8BPL, 8BQF, 8BRM, 8BRL, 8BRQ, 8BRT, 8BRZ, 8BUX, 8BVT, 8BWA, 8BZF, 8BXX, 8BZ, 8BZO, 8CAB, 8CAG, 8CAY, 8CAZ, 8CB, 8CBJ, 8CCX, 8CDK, 8CDZ, 8CEI, 8CFP, 8CGN, 8CGO, 8CGX, 8CKM, 8CKO, 8CLD, 8CMI, 8CNP, 8CON, 8COO, 8CPX, 8CQZ, 8CSL, 8CTN, 8CTP, 8CUE, 8CWE, 8CWF, 8CWS, 8CWX, 8CXX, 8CYB, 8CYT, 8CZW, 8DAK, 8DAL, 8DD, 8DH, 8DV, 8DZ, 8EA, 8FT, 8GH, 8HH, 8JL, 8JU, 8KG, 8KH, 8LZ, 8ML, 8MP, 8NE, 8NJ, 8PT, 8QB, 8SP, 8TD, 8UC, 8UE, 8UK, 8UZ, 8VQ, 8VY, 8WR, 8XE, 8XU, 8XV, 8YD, 8YE, 8YG, 8YR, 8YU, 8ZAE, 8ZAG, 8ZE, 8ZF, 8ZG, 8ZH, 8ZM, 8ZN, 8ZY, 8ZZ, 9AAP, 9AAW, (hi) 9AB, 9ABV, 9AIX, 9AIY, 9AJA, 9AJH, 9AJP, 9ALS, 9ANA, 9AOG, 9AON, 9APM, 9APS, 9APV, 9ARG, 9ARK, 9ARM, 9AUA, 9AXF, 9BAA, 9BDB, 9BGH, 9BHD, 9BLC, 9BSG, 9BUD, 9BZI, 9CBB, 9CEN, 9CF, 9DA, 9DBC, 9DCP, 9DCR, 9DFB, 9DGM, 9DKY, 9DR, 9DXN, 9EI, 9FK, 9GL, 9HW, 9IG, 9KP, 9LQ, 9NX, 9OX, 9PA, 9PF, 9PK, 9PW, 9QE, 9UH, 9US, 9UU, 9WU, 9XAC, 9XAK, 9XI, 9XL, 9YAE, 9YAJ, 9YAM, 9YF, 9YI, 9YQ, 9ZJ, 9ZL.

Fone: 1XAD, 2XB, 3XW, 3ZO, 3ANB, 3AWZ, 3AZH, 3CGX, 3CLD, 3CMI, 3CWP, 3YD, 3YU, 3ZZ, 9BDB.

Canadian—Spark: 2EH, 3BP, 3GN, 3GX, 9BS, C.W.: 2EF, 2FZ, 3BP, 3BV, 3JI, 3JK, 9AL.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility
for statements made herein by correspondents.



How One Novice Views Things

Manchester, N. H.

Editor, QST:

Have been reading with considerable interest the comments of dyed-in-the-wool radio amateurs on phone broadcasting. Will you allow a novice space to state his ideas?

First and foremost let me state that the present craze for broadcasts is being overdone. Stations are springing up like mushrooms and it isn't a healthy state of affairs. My humble opinion is that unless a novice graduates from the broadcasts and learns the code and has ambitions to own his own station, his interest soon dies. Therefore let us not discourage the beginner but lead him to delve deeply into the mysteries of radio communication.

Now as to the howl about interference that comes from some beginners. He sits down at his set, usually the wonderfully selective single circuit turned out on the Ford plan. He hears a hum or buzzing or perhaps the oscillations from other sets like his own and straightaway he damns the amateurs and says they should be shut off, etc. Now I am a former telegrapher and so I picked up the continental in about two weeks time; I used to growl about amateurs until to my surprise I found the interference from spark stations almost without exception was from commercial stations, mostly ships. I found the amateur very considerate and invariably when some really good broadcast was on and the amateur was going with his spark set all I had to do was phone them and they gladly shut up. This made me think they were a pretty decent bunch. Then I got hold of a copy of QST and straightaway got the bug myself and the broadcasts held no more charm for me.

If the novice will get the advice of some A.R.R.L. member and start off with a really selective set and not the contraptions masquerading as tuners, and will get the help of our League members in his vicinity, he will find QRM negligible save for a commercial station as noted. Moreover the increasing use of C.W. by amateurs makes for less QRM.

My suggestion is that the District Superintendents should keep the spark stations of their district quiet between 8 and 10 P.M.; that is enough for any decent listener to hog the time. I don't see any reason

for cutting out C.W., however, for in this city there is one 200-watter and several smaller ones and if they don't interfere with me less than a mile distant surely it is a question of proper tuning and a selective set. If the listener doesn't want to go to that trouble, why let him grouch. I hope the day isn't far distant when all amateurs will be on C.W. for it is really marvelous the way I can pick up fifteen or twenty a night with scarcely any effort. Have copied 5ZA on detector alone and on second stage could hear him out on the street.

Incidentally, can some brother tell me how to get rid of a terrific leak that makes communication impossible for days? Even on a loop you can't get a thing. Every set around me is affected the same way. We have looked for leaky power lines, motors, and every source we can think of, to no avail.

More power to the simon-pure amateur, and let's pull for less broadcasting and work for the real interest of the game. And you C.W. key pounders—start right in at dusk and go to it; I hate to sit up all night waiting for you to start.

Sincerely,

M. J. Ryan.

By Request

THE HONORABLES, THE SENATE OF
THE UNITED STATES IN CON-
GRESS ASSEMBLED:

SIRS:

TARIFF PROTECTION TO A MONOPOLY IN RADIO APPARATUS

Your petitioners, believing that there exists a monopoly in the manufacture, sale, use and importation of radio apparatus, submit that such monopoly should not be encouraged by tariff protection and that radio apparatus, particularly *vacuum tubes*, should be placed upon the free list.

Reference is made to (1) the testimony before the Radio Conference Committee appointed early this year by the Secretary of Commerce, (2) one of that Committee's basic recommendations to the effect that radio apparatus should be freed of existing restrictions, and (3) the fact that importation of radio vacuum tubes—even for Government purposes—is virtually prohibited by the combine and/or its affiliated interests. Thus America is restricted to tubes of comparatively inferior quality and

to a most limited selection as to power and type. For instance, four-element tubes are not obtainable in this Country, though freely made and used abroad.

We do not presume to express an opinion as to whether a legitimate patent monopoly can legitimately be combined with all other patents and patent rights of like nature. It is manifest, however, that such combinations can be used to defeat the anti-trust laws, are contrary to public policy and should not be fostered by tariff protection.

We believe that the Army and Navy Departments have a large surplus quantity of radio vacuum tubes the disposal of which have been tied up by those interested in the monopoly. Enquiries made abroad meet with replies to the effect that importation of such tubes into this Country is prohibited—not by reason of the tariff, but by the control here of foreign patents and patent rights.

Your petitioners pray that radio vacuum tubes be placed upon the free list—at least for research and amateur experimental purposes.

Respectfully submitted,

The Plainfield Radio Association,
In behalf of itself and other New Jersey
Radio Clubs and Associations.

J. P. W. Taylor,
President.

[The above communication is published in this department at the request of the Plainfield Radio Assn. The Editor has not crystallized his ideas on the subject as yet and accepts no responsibility for the petition.—Ed.]

More on Msg Delivery

East Orange, N. J.

Editor, QST:

Re the letter of Mr. R. C. Schryver, 9AWL, I think the comment and suggestions looking toward a remedy of the "Rotten Msg. Delivery" evil, which has saddled us from the beginning of amateur radio are in order. One thing we frequently hear over the ether is:—"Got any kids over there? Hr msg 4 John Doe, Rush." Usually the "kids" are not available, and we ourselves either don't feel like laying down the cans and running out to deliver it, or don't know just where such and such street is, and they haven't any fone etc., so finally the msg. sinks to the bottom of the pin, and later the waste basket.

That same temptation has confronted me, and I've solved it. Uncle Sam's postmen know streets and numbers admirably, so I keep a stack of penny post-cards at hand, and as soon as a msg. arrives it is copied on one of them and friend wife dumps them in the mail-box on the way to the movies, or it goes first thing in the morning en route for work. A better plan would be to buy two-cent envelopes and put the msg. on an A.R.R.L. blank. In

this way there is no delay, and delivery is sure. Moreover, no messages are permitted to roost here more than ten hours, or, they're mailed the morning after the night before at the very latest. I don't think a stack of 25 penny cards or envelopes will bust anybody, and besides, give Uncle Sam a chance to make a few cents on the local haul.

Very truly yours,

E. W. Lehmann, 2AHM

Honeycomb Coils

Providence, R. I.

Editor, QST:

Recent issues of QST contain some articles throwing more light on the use of honeycomb coils and their manipulation generally. As we ventured to ask for more light on this subject in an earlier issue we are grateful accordingly, for we have by no means attained any great skill and proficiency with these coils and fancy we still hear WSO about as loudly as the experts hear POZ, and we are frequently guilty of using amplification at that—whereas the expert seems to need but the single bulb, the more credit to him accordingly.

One contributor finds our experience "astonishing" and states that it was the operator and not the coils which "sweat" in his case, and even suggests that our locality may need the attention of the prohibition authorities. Perhaps it does, but if it was so "dry" the operator had to sweat we wouldn't live in it. Incidentally we notice that recent editions of these coils are equipped with different straps or fastenings from the earlier type, and 2ATV reports the use of celluloid bindings which stand the hot weather O. K.; so we do not feel that our experience was ours alone.

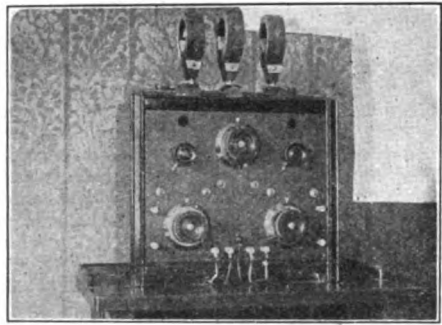
There seems to be nothing novel in the hook-up used by most contributors and with like apparatus one would expect like results, at least to a reasonable degree. However, one amateur uses L-1500 in the secondary for NSS and wishes he had about an L-2500 while another uses L-1250. The first amateur uses a .001 condenser in shunt and turns in about 85 degrees of capacity, the second uses a similar condenser and but 52 degrees of capacity. However condenser scales vary, some reading from 0-50, some 0-90, and others 0-100, 0-180 and even 0-200. Also the condenser may themselves vary somewhat. But since maximum inductance and minimum capacity is advisable why not use the largest inductance available for NSS—it is none too large! Again one amateur uses L-1000 in the primary for a wave of 15,500 meters and L-750 for a wave of 16,900; which seems a little odd. In our own case we have never been able to use a larger coil than L-500 for NAA or time and the coming of summer forced the use of L-400. A friend uses L-600 to advantage. In summer we have had to use smaller coils

for 'most all wave lengths, but with a friend's Grebe CR-5 receiver no noticeable differences were found due to the weather. One amateur we believe recommended somewhat larger ones than shown in the DeForest catalog for most waves. So all in all there seems to be no such thing as an absolute standard for these coils and the amateur who attempts to give exact data for their use may find himself glorified or abused in accordance with the results obtained by others. Like the "time, the place and the girl" all factors must coincide—but generally don't. (Ask 1ZE, who writes about such things.)

But it should be possible to outline briefly the general procedure adopted in tuning these coils and to follow with a short statement of the results attained. We have Mr. Groves invaluable articles and a recent contributor's article promises to be most interesting in these respects. Personally we are inclined to believe that a large part of the trouble experienced with these coils is due to the primary circuit, the selection of a proper primary coil. On the long waves particularly stations may be heard with 'most any old coil in the primary and with the condenser spun around like a top. Even without any primary coil long wave stations may often be heard quite distinctly. The addition of the proper primary coil, properly tuned, ought therefore to step-up the signals enormously. But we have not yet obtained the step-up expected. No doubt the selection of the primary coil depends in some measure upon the aerial but the difference in the size of most amateur aerials in comparison to the wave length to be received must be small. Thus we find most amateurs using coil L-750 in the primary with a .001 condenser in shunt for the average long wave station, or a larger coil with the condenser in series. We have tried various coils, with both shunt and series condensers of various capacities and have tried out several aerials, and have also listened in elsewhere, and invariably NAA comes in louder than NSS. In fact it is on say 600 to 2500 meters or so that we have had the best results with these coils. Here the tuning of the primary is fairly sharp with proper loose coupling. Incidentally a friend calls our attention to a statement in Robinson's Manual of Radio Tel. & Tel. which says "It has been found that the ordinary 'tickler' coil circuit does not function well on the longer wave lengths, but is particularly good on the shorter ones." Possibly the detuning in the secondary circuit is responsible for some of the trouble on the long waves—has any amateur tried out the separate oscillator or heterodyne with honeycomb coils? It requires the use of another bulb of course, but we should like to see the results obtained with a proper heterodyne compared with those of a tickler hook-up and one step of amplification

(Two bulbs in each case). Won't someone who has been able to make the very most of the tickler circuit try out this heterodyne on the long waves?

Another difficulty we have experienced is on short waves. At times (much too often) we cannot set the bulb to oscillating with a clear and pronounced click. It gets to oscillating after a fashion but the whole procedure is too "mushy". At such times any distance becomes difficult if not impossible since there is no critical position for the reception of radiophone music etc. from the tickler coil; i.e., a point where the bulb is most sensitive without spilling over. We



have tried every possible adjustment of the "A" and "B" batteries and every size of tickler, and we have exhausted the radio bug's rather specialized vocabulary on it, to no good. Sometimes it will and sometimes it won't, mostly the latter; surely a V.T. is of the feminine gender. No wonder the Y.L. has such success at 1XE—she understands the nature of the thing; besides 1ZE says she is over six feet tall and that is intimidating by itself—we are but five foot eight. Perhaps the remedy is to be found in the use of a tuned plate circuit rather than tickler feed-back, as suggested by Mr. Groves, and perhaps the man who insists on using these coils on waves below 600 meters merely invites trouble, qu'en s'abait? But for the sake of the "universal receiver" it seems necessary to obtain the best results possible with them on all wave lengths. Hence the struggle. We have tried out the single layer coils issued as a substitute for honeycombs on short waves but find that on such waves the size of the primary coil depends entirely upon the aerial, and our aerials failed to coincide—also the tickler coil was not equal to its task. Some home-made coils did better—but looked worse. Maybe we shall try again. Incidentally does any one else addicted to a single bulb use the class II or amplifier, as Mr. Groves does? If not, can his exceptional results be accounted for in this way so far as apparatus goes—it seems to be the only novel feature of his set, and a bulb that only requires two volts fila-

ment current for maximum strength signals and that can be run on four dry cells in series-parallel is novel enough in these days of U-V's.

We have visited several stations, ship and shore, and have usually found an expensive regenerative receiver and a two-step amplifier and an aerial that made us the reverse of homesick, but unfortunately such stations were not engaged in receiving the long waves. Has any amateur visited a long wave receiving station; if so what is the equipment used, from aerial to ground inclusive? In reporting the results of such reception we have often noticed that the message mentioned that one or more steps of amplification were used. Wherefore we have wondered again whether those of us, of a commoner clay than the expert one-bulbers, may not need a little help in bringing Europe next door. True we have read that Marconi received signals from Europe with only a kite and a coherer, but we should hardly mention clay in his connection let alone common—besides if we wanted to put up a kite the wind wouldn't blow.

Touching the matter of home-made or self assembled sets we wished to get the coils off the panel and out of the way so to speak and so ventured to place them on top of the cabinet and the photograph shows the general appearance of the set which we think fairly compact and efficient. The panel is about 9" x 11" and shows the primary, secondary and plate condensers, the two rheostats and the necessary binding posts. On back are also the two bulbs (one step of amplification), transformer and the necessary Murdock connecting blocks to accommodate the leads from the coils on top. We have two aerials, both single wire, one 130 feet long by some 30 feet high and the other about 200 by 40. We should prefer a shorter and higher aerial, also a better set, but greatly fear that we are no more proficient in affairs of the pocketbook than in our hobbies, wherefore we pray the indulgence of those whose apparatus, like their skill, more truly approaches the ideal.

A Novice.

Stupid-Degeneration

Mi dere Meestair Armstrong and Meesetir Warner et Cie:

i write at deese time to tell you how vair mooch obldige i am for dat wonderful circuit wich you put out last month. i am de firs man to try heem an also de las because i am now a martyr to de radio and also in de hospeetal. i connect her up like you say an she no work so i invent new way wich work so good dat de seegns bust de bulbs and de glass go in my snoot and blue fire she burn me an de fones make de tar melt from de earcaps an burn my ears and my beeg honeycombs are burn an my money is gon an everyting an i hav now won (1)

audiotron left wich were not connect at do time an a Grebe CR-3 wich I also had hook in an wich now is no dam good an wich de primairy an secondary are fuse togaither an wen any dam fool tell you to use amplify transformaire for filter choke do not believe heem. i also am redy to make some more favorable an valuable data by saying dat you should nevaire use no B battery of 120 volt in dat super regenerative cirkit because you will be soup too if she do like mine. Et is better to use de flashlite battery first, and den add de beeg one. Et is a fine cirkit tho an shood work ver fine wen you receive liteneeng.

i tank you for dat cirkit,
Mike O'Farad.

1AAW Uncarthed?

Editor, QST:

Perhaps you have heard of a fellow who signed off 1AAW during the Trans-Atlantic tests. I had a powerful transmitter and thought I would sign 1AAW on the small chance of getting some DX stuff around the states but I never dreamed of reaching Godley. I chose the call 1AAW because it struck me as having a good swing. At the time my station was in — Maine but as Maine is a large state I can be assured of the fact that you will never find the station. I will give you a hint and that is, if you draw a line 110 miles in from the coast, and parallel with the coast, my station will be somewhere in there. In a way I am scared of admitting more so that is why I won't sign this.

I assure you that I am not as dumb as you would think. I know that you have already thought over the post mark several times but it will not do you a bit of good because I am motoring thru here and will be near N. Y. City when you get this. I am wearing gloves in writing this so tough luck again. If I can ever be of any help to you please call on me.

"RADIO FOR EVER"

[We have no proof that the above was written by the operator that signed 1AAW during the Trans-Atlantics. The real sender may still be lying in quiet. At least we want more data before we let the matter rest.—Ed.]

Immortal Waves

Editor, QST:

While you are passing around all the prizes for various accomplishments I think it would be well to give the following record a look-over and see if station 2FS can't collect one or more.

In the "Calls Heard" of August we see station 2FS on C.W. reported by Canadian 2DC.

The waves from the transmitter at 2FS have travelled a distance of 3,866,196,000, 000 miles!

The proof of this is that since the last time that 2FS was in operation, October 1 1921, until the reported reception at Montreal, the signals must have gone around the earth a matter of 154,647,844 times.

Come on now, Eddie, please send all prizes by express, *prepaid* as due to the summer slump we have no surplus cash to pay expressage on large shipments.

73's

Howard L. Stanley.

[It has come to our attention several times that stations have been reported in "Calls Heard" department when these stations had been long non-existent. Let us call our readers attention to the rules regarding reporting "Calls Heard" published at the head of this department in the June issue. Come on, gang, with better lists.—Ed.]

G.M.T.

Elizabeth, New Jersey.

Editor, QST:

In your circular, Rules and Regulations of the Operating Department, I note that Eastern Standard Time is specified for listening in sections A, B and C.

I am interested to know if you have considered the use of Greenwich Meridian Time (G.M.T.) in the place of Eastern Standard Time. Next winter you will begin to talk with Europe and the question of a common or international time standard is one of the first to be decided upon. Also our own country including Alaska covers quite a range of latitude. As radio is now a world-wide affair and one time standard is necessary to avoid confusion there is no question but that G.M.T. should be used as it is independent of local, railroad, daylight saving or sectional time and it is already in quite common use in marine work. (See Radio Service Bulletins.)

Some of the Canadian railroad schedules are now on the basis of 24 hour time and it would be a great improvement over present conditions if all the railroads on this continent could be operated on one 24 hour unchanging time standard not affected by zones, local or seasonable changes.

As our country covers such an expanse of latitude nothing will be gained by using any standard other than G.M.T. and it seems that the amateur radio operators of this country have a great opportunity in making the benefits of G.M.T. more generally known.

Cannot this be discussed in QST?

Yours very truly,

E. M. Tingley.

Paralyzed Transformers

Radio 2AZA.

Editor, QST:

A year or so ago there appeared in QST an appeal from a Houston radio club ask-

ing for assistance in combating "paralyzed" audio-frequency transformers. The appeal held my attention because it was a repetition of my own case though on a larger scale.

I had had a two step amplifier which was made by a company of unquestionable standing and of course it made me wonder a great deal when I sat down to work the thing after I had had it a while and it refused to give me a single peep. Thinking that the soldering flux might have been doing some corroding on its own hook I proceeded to operate on the transformer. After removing the lugs I again connected the leads to their respective binding posts and was rewarded by the same sphynx-like silence.

Before I had time to do any more to it I was called to a "job" in Virginia. They had three fishing steamers and a small land station and I was rather surprised when I discovered that practically all of the sets had at least one of the "paralyzed" transformers. Remembering my own experience I discouraged any efforts to dissect them, but while hunting around to try to find out what was the matter my fingers touched the two primary binding posts of the sick transformer. Lo and behold the signals came rolling in as of yore! After a short period of pride in my achievement I realized that it would be impracticable for me to stand with my hand in that position and operate my set. I recalled the pencil mark grid leak resistance and tried it; the results were fine. I think the fact that the resistance was variable added to its merits. Shorting the primary cut out the signals. I and my fellow operators soon cured the transformers in all the sets by this means.

Armed with this knowledge I set about to try to fix my own amplifier. The resistance across the primary helped somewhat but with this one I found that if I took a piece of No. 22 D.C.C. wire and connected the top primary binding post to the top secondary binding post the signals were restored to their normal strength. Thus it will be seen that the two methods were effective in different cases.

Why this sort of thing works I don't pretend to know and I should be greatly obliged to anyone who can explain it to me. In all the cases which I have mentioned it was the transformer in the first step of amplification which was at fault.

Yours truly,

Paul C. Oscanyan, Jr.

Induction from Telephone

Editor, QST:

Here is something that we need help on. The telephone office in this town has a machine which they use to supply their juice for ringing purposes. This machine runs off of the 110 volt line. It consists

of some sort of a vibrating unit that makes a small spark every time the vibrator makes and breaks contact. Now every time this spark occurs, we can hear it via radio and when we get 2 steps and a Magnovox hooked on it makes enough noise to drown out all the worst static that ever ticked in this country. It will even drown out 9YAK's noise.

To cut this short, I would very much like to know if any of the readers of this little book have ever had any experience with this trouble and if so what did they do to stop it? We have tried connecting a resistance of carbon rod across the points and grounding the center; have enclosed it in a metal box and grounded that; have taken off two or three condensers and the noise is as bad as ever. At a distance of two or three blocks it is still audible but does not bother very much. This machine is made by the Leich Electric Co., but they can give us no remedy for the trouble.

Very truly yours,
S. R. Wilson, 9ALM.

N. H. JENSEN

(Concluded from page 42)

the British Navy and finally assisted in taking over the German High Seas Fleet.

Finding himself in Sioux Falls, S. D., in the fall of 1919 he became interested in amateur radio and the A.R.R.L. Although he has not been situated in such a way that he could have a station of his own, he has stood many watches at 9UT and 9AIG. He was chosen by the Y.M.C.A. Radio Club (affiliated) as Chief Operator and City Manager, A.R.R.L., but due to his persistent work for the League he was soon made District Superintendent and has recently been appointed Dakota Division Manager, which position he holds with "courtroom" dignity.

AMATEUR RADIO STATIONS

(Concluded from page 45)

The antenna is composed of five strand tinned copper wires 45 feet long and 70 feet high. Two masts 30 feet high elevate the antenna from the apartment building roof upon which it is located. It is of the "L" type with lead-in wires fanned to the edge of the roof. The end opposite the lead-in is fanned out. Hollow spruce masts are used to elevate the antenna and are guyed with 8 guys apiece. The spreaders are also of hollow spruce, the masts and spreaders being well varnished. Ground is made to the steam line and city water system. A counterpoise tuned to the ground system will be added.

A. E. BANKS

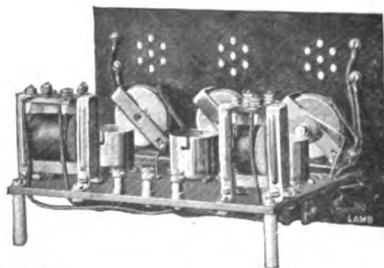
(Concluded from page 42)

Scouting centers.

During this period Major Banks acquired the special license, 6ZB, and installed one of the early C.W. sets in the southern section of the 6th district. The 20-watt set was heard as far west as Hawaii and as far east as Kingston, Ontario, New Jersey, and Florida. Most amateurs have some constant wail. ZB seems to concentrate his disgruntlement on the arc mosh from neighboring NPL and spark harmonics, which he says prove most discouraging to good reception.

6ZB is one of the charter members of the Sunset Radio Club, the San Diego organization recognized by and affiliated with the A.R.R.L., of which, needless to say, he is also an enthusiastic member. He was recently elected to the Board of Managers of the C.W. Club of America. Major Banks saw two years duty in the Army during the recent war and served eight months in France in the Medical Corps in the capacity of Divisional Staff Officer. He is still commissioned in the Medical Reserve.

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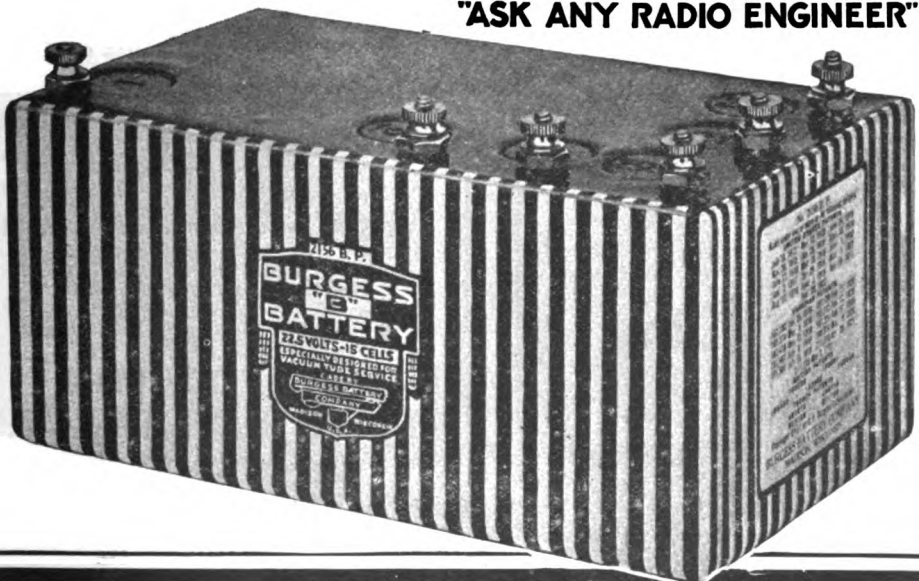
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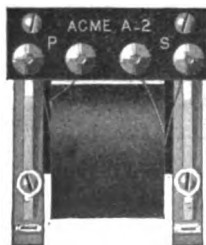
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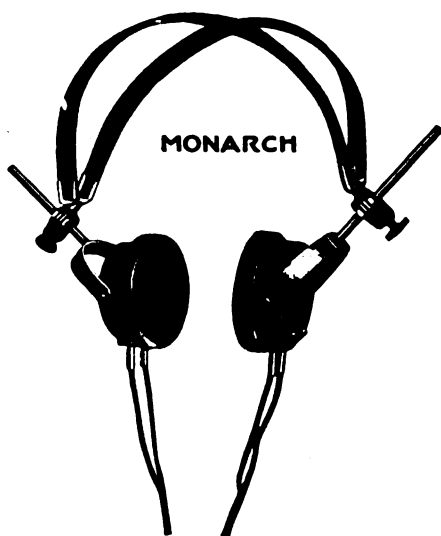
You can buy either transformer at your nearest radio store or write the Acme Apparatus Company (pioneer transformer and radio engineers and manufacturers), Cambridge, Massachusetts, U. S. A. (New York Sales Office, 1270 Broadway.) Ask also for interesting and instructive booklet on the use and operation of amplifying transformers.



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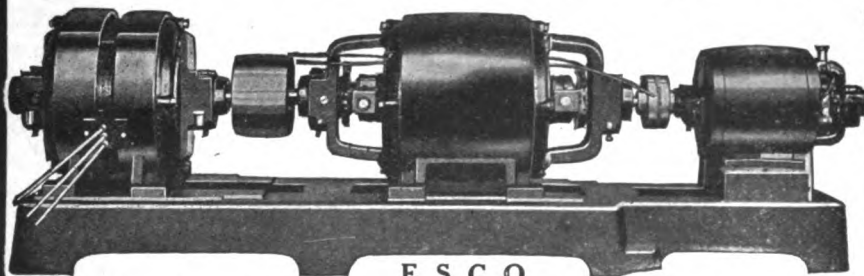
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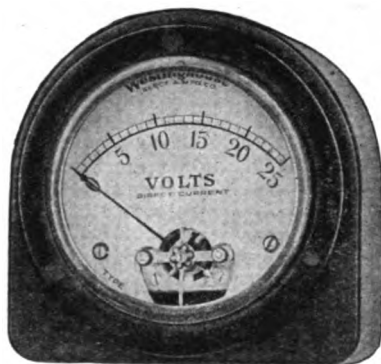
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The contact springs are heavy enough to carry without arcing, the current for 5 watt power tubes.

NEW PRICE\$1.25

The TYPE 247 Condenser is now made in the .0005 M. F. capacity as well as .001 M. F. Its electrical losses are but $\frac{1}{4}$ those of the ordinary variable condenser.

.0005 M. F. Mounted, Calibrated.....\$550

.0005 M. F. Unmounted..... 3.25

.001 M. F. Mounted, Calibrated..... 6.00

.001 M. F. Unmounted..... 3.75

Send for Free Radio Bulletin 911-Q

GENERAL RADIO CO.

MASSACHUSETTS AVENUE AND WINDSOR STREET
CAMBRIDGE 39, MASSACHUSETTS

Standardize on General Radio Equipment Throughout

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

SOUTHWESTERN AMATEURS

We are about to pass out of the long hot summer and hit the pace once again for a real winter of hi-pressure wireless activity. We wonder if you have ever stopped to think of the service that might be rendered you by this store.

We are thoroughly capable, being the oldest exclusive radio store in the Southwest, and have six licensed operators at your service. We are proud of that. Give us a trial.

THE SOUTHWEST RADIO SUPPLY COMPANY

1812 Main Street,

Dallas, Texas

"Pioneers in Radio"

SIMPLEX—that's your safeguard



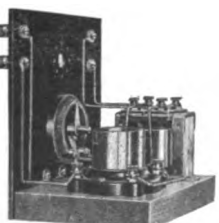
VARIO-COUPLER PANEL



VARIOMETER PANEL



DETECTOR PANEL



AMPLIFIER PANEL

Also Unmounted Variometers & Variocouplers

Simplex Panel Units make it possible to try out many different hook-ups without disassembling panels. These highly perfected units eliminate much of the uncertainty of success in receiving radio broadcasts because they have been designed by men having years of experience in radio activities. Get them from your dealer.

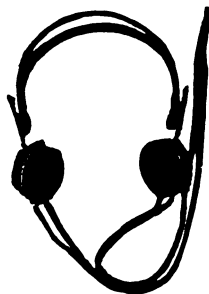
SIMPLEX RADIO CO.

1013-15 RIDGE AVE.,

PHILA., PA.

"East and West, the Globe is Best"

GLOBE RADIO HEAD PHONES



Highly sensitive
Matched receivers
Natural in tone
Each receiver tested
by radio
Lightweight (11 oz.)
Comfortable to wear
Will not distort signals, when amplified
Articulation perfect

2200 ohms List price only \$9.00

There are many types of head sets on the market but not too many good ones. The GLOBE RADIO HEAD SET incorporates a knowledge of acoustics based on nearly fifteen years of experience in making high grade sound producing and receiving instruments. It embodies correct design with the best of materials. The Globe Phones are for those who discriminate.

Ask about the Globe Antenna Attachment Plug for connecting your radio set to your electric light circuit.

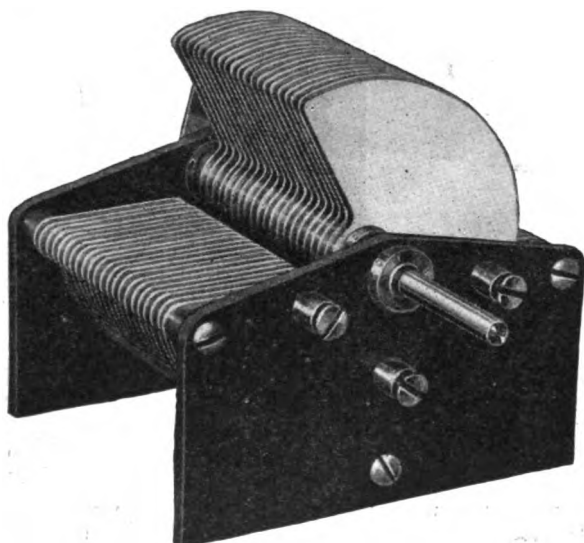
Buy from your local dealer, or write us direct.

GLOBE PHONE MFG. COMPANY

Earl C. Hanson, Technical Radio Expert

READING, MASSACHUSETTS, U. S. A.

Wimco Announces



THE WIMCO VARIABLE CONDENSER

After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

Deliveries on The WIMCO Variable Condenser will begin September 15th and we are now accepting Jobbers and Dealers orders.

We have a very attractive proposition for the Jobber, and solicit your inquiries.

THE WIRELESS MANUFACTURING CO.
CANTON, OHIO

Manufacturers — Distributors



MU-RAD M-A 12

Receiving Set

With Two Telephone Plugs **\$128**

The Most Highly Perfected Radio Receiving Set On the Market

More sensitive than any commercially marketed radio receiver. A complete receiver with the addition of tubes, batteries and phones. Can be used with either small coil, loop or antenna. Pick-up coil as small as 3" in diameter may be used for distances up to 200 miles from the average broadcasting station.

Craftsmanslike in Appearance and Performance

A masterpiece of the finest woodworkers, machinists and laboratorians. Complete instruction book is furnished with each set. Positively guaranteed against defects. Bulletin #18 on request.

Excellent Proposition for Dealers and Jobbers

The radio public this fall will insist on quality. MU-RAD Receiving Sets will sell faster and earn the radio business man a larger profit.

MU-RAD LABORATORIES, INC.

800 Fifth Ave., Asbury Park, N. J.

MOFFAT

Choke Coils 100 millihenry; Non-inductance Resistance Units 12000 Ohms; Insulated shaft Extensions which prevent detuning of signals, Vernier Adjusters.

We manufacture a full line of Standardized Equipment, Variometers, Vario-Couplers, Switch Levers, etc. Send for catalogue.

JOSEPH ROSS & CO.

IRVINGTON, N. J.

Established 1875

12000 OHM

Non-Inductive

RESISTANCE UNITS

For use in the new

**Armstrong
Super-Regenerative Circuit**

PRICE \$2.00 EACH

THE PROMETHEUS ELECTRIC CO.

511 West 42nd St.

Est. 1901

New York

DEALERS ONLY—

Write for Harry Alter's RADIO "POCKET-BOOK." A net price catalog of radio supplies published each month. Our wholesale prices hit bottom. The RADIO "POCKETBOOK" sent free to dealers only. Use your letterhead.

HARRY ALTER & CO.

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Eveready "A" Batteries
 —hardwood box, mahogany finish
 —convenient handle, nickel plated
 —rubber feet protect the table
 —insulated top prevents short circuits
 —packed vent caps prevent spilling

No. 6860—90 Amp. Hrs.—45 Lbs.—\$18.00
 No. 6880—110 Amp. Hrs.—52 Lbs.—\$20.00



Eveready "B" Battery No. 766
 Equipped with 5 positive voltage taps ranging from 16½ to 22½ volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price \$3.00



Eveready "B" Battery No. 774
 Equipped with 6 positive voltage taps at 4½ volt intervals ranging from 18 to 43 volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price \$5.00



**For Better Results
 USE**

EVEREADY
"A" and "B" BATTERIES
with your radio set

For sale by the better radio supply dealers everywhere

Send today for descriptive booklets

NATIONAL CARBON COMPANY, Inc.
 Long Island City, N. Y.

Atlanta Chicago Cleveland
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DAYTON Radio Products

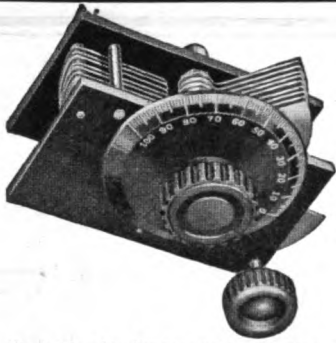
A complete and meritorious line of Radio parts with every article guaranteed for accuracy and its capacity in Micro-farads. Sold only thru legitimate Jobbers, Dealers and Manufacturers. Variable and Vernier Condensers are made of hard aluminum plates mounted on Bakelite Panels; furnished with either square or round panels.

Type 3 P. C. Vernier with Knob.....	Price	\$2.00
Type 9 P. C. Condenser Cap. .0003 Mf....	Price	3.35
Type 17 P. C. Condenser Cap. .0005 Mf.	Price	3.95
Type 31 P. C. Condenser Cap. .001 Mf....	Price	4.80
Type 45 P. C. Condenser Cap. .0015 Mf.	Price	5.65
Condensers with Vernier attached	80c extra	
Variometers Bakelite Tube Type.....	Price	4.50
Variometers Moulded Bakelite.....	Price	7.50
Vario-Couplers Bakelite Tube Type.....	Price	5.00
Vario-Coupler Moulded Bakelite.....	Price	8.00
Genuine Bakelite Knobs and Dials 3"	Price	1.00
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Rubber Insulating Tubing (10 ft. Packages)		.45

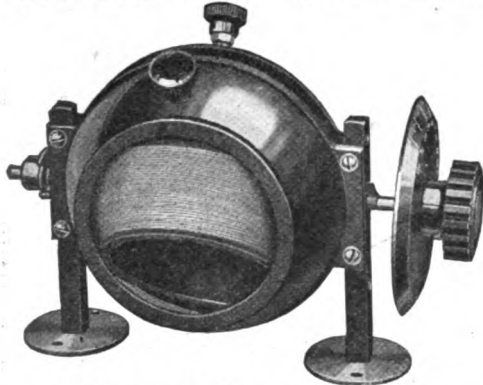
Jobbers, Dealers and Manufacturers Write for Catalog No. 2 and Discounts

THE A-C ELECTRICAL MFG. CO.
Dayton, Ohio

Makers of Electrical Devices for Over 20 Years



Dayton Variable Condenser with Vernier Attached



Dayton Moulded Bakelite Variometer



**Hot Wire
or
Thermo
Couple?**

For small size, small capacity radiation ammeters the hot wire mechanism is far superior to the thermo-couple type. That's why our small 3 1/2" radiation ammeters are of the hot wire type.

The Roller-Smith Company being the only maker of both hot wire and thermo-couple types is in a position to know which is best—and it does.

Send for Bulletins No. AG-10 and No. AG-810.

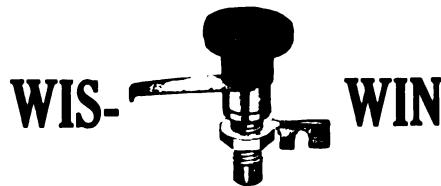
They are free.

ROLLER-SMITH COMPANY

16 PARK PLACE, NEW YORK

Offices in principal cities in U. S. and Canada

**Switches our main line,
NOT a side line**



One of our leaders #755 Full bushing switch 1 3/8" blade, spring contact washer, highly polished nickel parts.

Price 40c

Buy your switches from a switch concern, thereby getting full value and quality at the lowest prices. Switches ranging in price from 30c to \$1.25 for all uses and requirements.

We have an attractive proposition for the trade. Circular S-1 listing our full line gladly sent upon request.

We can make prompt deliveries.

Willis Switch & Instrument Co.
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RADIO MERCHANDISE

F. D. PITTS CO.

Incorporated

219 COLUMBUS AVENUE, BOSTON, MASS., U.S.A.

Announces a change of Policy

WHOLESALE ONLY



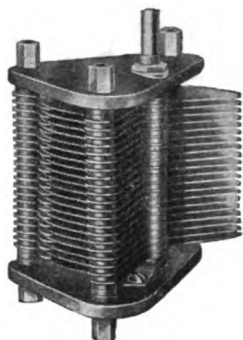
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Dealers are urged to send for our latest stock sheets, listing desirable radio merchandise for immediate delivery at attractive discounts.

The retail and mail order business formerly conducted by the F. D. Pitts Co. at 12 Park Square, Boston; Providence, R. I. and Springfield, Mass., is now operated by the "Pitts Radio Stores, Inc." at the same addresses.

Dependable Radio Supplies



Benwood Variable Condenser

Note the improved stationary plate design—this condenser has the greatest capacity for over-all size of any variable condenser made. Single bearing, wiping contact assures positive connections. Heavy aluminum plates will not bend or buckle. Solid Bakelite ends. 48 plate, .0011 Mfd. Each\$2.95

Send for Catalog

You can **DEPEND** on "Benwood" parts or sets. Send 10c in stamps for the Benwood catalog and price list, also complete catalog and price list of DeForest Radio Equipment.

Dealers

We manufacture high grade radio supplies in our own factory and have stock ready to ship. Write or wire for our liberal dealer's discounts. New price and discount sheet just issued.



Benwood Audio Transformer

Completely sheathed in metal—gives full 4 to 1 amplification without howling or squealing. Base is 2 1/4" x 3 1/2", height only 2 inches—ideal for either base or panel mounting. Core is best laminated steel giving highest transference of energy. Each.....\$4.00



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We can supply you with anything on the market for that C.W. set you are going to use.

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American Electric HIGH EFFICIENCY TELEPHONES

"Army and Navy" and
Swedish-American Types

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COMPANY

CHICAGO, U.S.A.

For 30 Years Makers of Good Telephones

Agents for the



COLUMBIA RADIO
SUPPLY CO
808 19th St. N. W.
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DX RADIO FREQUENCY TRANSFORMER

Be up to date, use R.F. Amplification and coil aerial. The secret of long distance reception. We know it is superior, prove it for yourself. Free folder on principles of radio frequency amplification with pictorial diagram.

DX 1—170-450 meters \$8
DX S—400-1200 meters \$8
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Plug-in socket mounting \$1

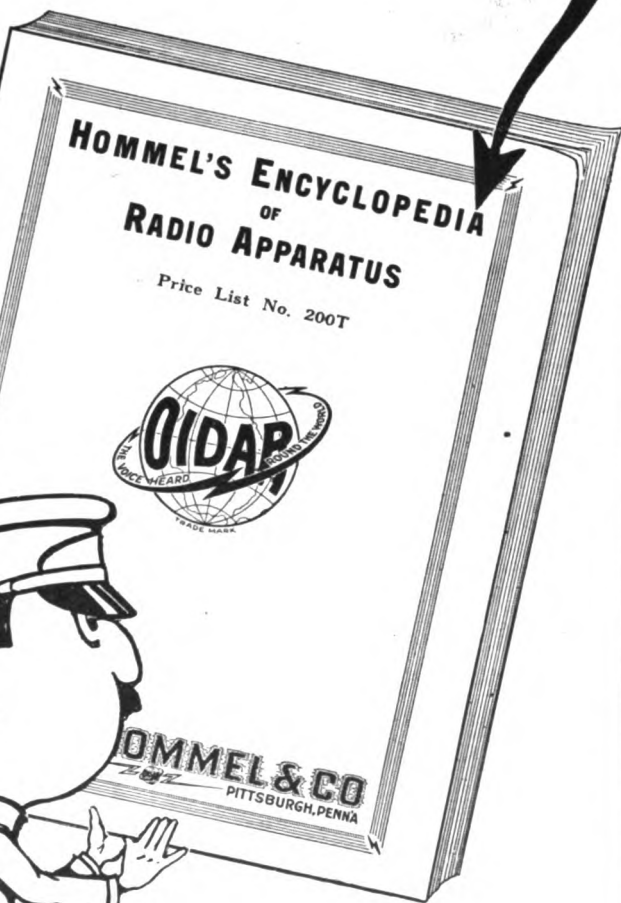
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Send for it
NOW

LUDWIG HOMMEL & CO

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Radio brings it *MAGNAVOX* tells it



Many a natural born "radio enthusiast" has so far been discouraged from going on with this wonderful new science by the restrictions inherent in the use of telephone headsets—or an unsatisfactory "loud-speaker."

Attached to any commercial receiving set, the Magnavox Radio reproduces every sound in volume and marvelous clarity, transforming wireless from a scientific fad into a universal home entertainment and inspiration.

Write for descriptive booklet

THE MAGNAVOX COMPANY

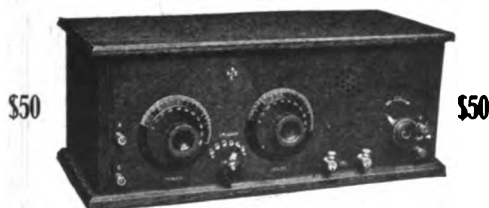
Oakland,

California

New York Office: 370 Seventh Ave., Penn. Terminal Building



If **QUALITY** counts, bear in mind that **ACE** equipment speaks for itself. An Ace type **TRU** Concert Receptor can be placed in your parlor, and is in a class with your piano or finest phonograph.



Licensed under Armstrong Patent No. 1,113,149

For electrical efficiency we claim our **TRU** to be equal or superior to any similar equipment now on the market.

A very important point to be considered in purchasing a Concert Receiver is the proposed change of wave lengths of broadcasting stations. The majority of Radio receivers now on the market would be worthless should this change be effected. Our receiver is arranged for immediate adaption to this change by even a most inexperienced person.

Better investigate—we have literature for the asking.

THE PRECISION EQUIPMENT CO.
2437-39 Gilbert Ave., Cincinnati, Ohio

BRACH vacuum LIGHTNING ARRESTER

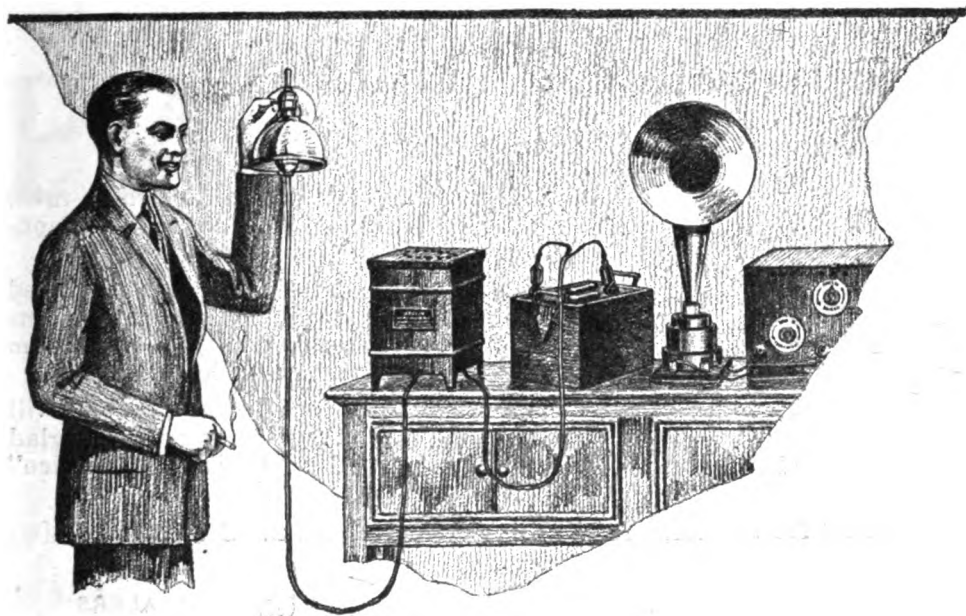
Not only since radio has become popular has the Brach Arrestor been demonstrating its superiority, but for the past 16 years it has been used by the principal railroad and telegraph companies, by fire alarm systems, by the U. S. Army and others.

The Brach Vacuum Lightning Arrestor stands like a sentinel, day and night, guarding your radio and home against interference and destruction—does it automatically, requiring no switching or other attention. Both indoor and outdoor types.



Listed by the Underwriters' Laboratories.

L. S. BRACH MFG. CO.,
NEWARK, NEW JERSEY
16 Years Specialists in Lightning Protective Apparatus



Charging Storage Batteries Easy as Turning on the Light

Tube sets require storage batteries, and they in turn require charging. You can do this at home merely by turning on the electricity, if you have a Tungar Battery Charger.



Tungar

The device that keeps batteries at home

Tungar is a device for changing alternating to direct current. It allows the current to flow only in one direction. It requires no attention while operating. Its first cost is not high and its cost of operation is extremely low.

Tungar Battery Chargers were developed in the Research Laboratory of the General Electric Company over six years ago. Thousands have been in successful operation ever since.

Do you prefer to carry your battery to a charging station, wait a couple of days or more, and then pay three times what it would cost you to charge it at home? Our new booklet on the application of Tungars to radio batteries will give you the details. Ask us for Booklet B-3640, if your dealer cannot give you one.

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Sales Offices in
all large cities

AMATEURS

Does Service Mean Anything to You ?



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SERVICE

PATRONIZE an organization for radio men, rendering personal, intimate and harmonized service with every article it sells.

HIGH grade apparatus only, manufactured in accordance with the latest designs and theories. Guaranteed to give maximum results under working conditions.

WHEN in town drop in to see us. We will always be here to greet you with a glad hand, ready to render "Individual Service" that will make you a satisfied customer.

Latest News: Armstrong's Super Receiver Data. Set 25 cents.

ALL PARTS
NECESSARY
NOW
AVAILABLE

THE RADIO ELECTRIC CO.
Manufacturers and Jobbers in
RADIO EQUIPMENT
1427-29 LIBERTY AVENUE
PITTSBURGH, PA.

DEALERS
WRITE FOR
SPECIAL
QUOTATIONS

McTIGHE ALKALINE STORAGE "B" BATTERY

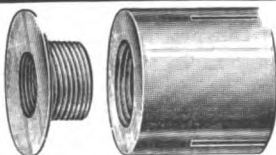
for RADIO OUTFITS



The McTighe Storage "B" Battery is the most satisfactory for radio use. It gives 22 volts, is inexpensive--noiseless--cannot be damaged by short circuit, overcharging, standing idle or uncharged. Can be fully charged from any light socket for less than one cent. Is furnished in an oblong glass which nests neatly. The McTighe Rectifier is cheap, simple, durable and effective, and should be used when charging the McTighe "B" Battery.

Battery \$5.00, Rectifier \$1.50, Rubber Filler 25c
F. O. B. Irwin, Pa.
Discount to Dealers Prompt shipments

ECONOMIC APPLIANCE CO.
IRWIN, PENNA.



ATTENTION RADIOTICS

IF YOU USE AMPLIFYING TUBES you can make your Victor talking machine a **RADIO LOUD SPEAKER**, with a "BEEKO" Radio-Phone attachment.

Sample by mail, 40c.

Liberal discount in quantities

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The **OGDEN WIRELESS LABORATORIES**

THE O.W.L. RHEOSTAT

Patents pendings

An instrument of real Value, NO THERMO-ACTION resulting in distortion because all parts are made of the same resistance alloy throughout.

PRICE - - \$1.00

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New York City

PARAGON

THE

Pioneer

- 1915 First regenerative receiver ever manufactured bore the name PARAGON.
- 1916 First Trans-continental Amateur Reception (California from New York; not pre-arranged) effected with a PARAGON Type RA-6 Receiver.
- 1916 First Trans-continental Amateur Transmission (New York to California; not pre-arranged) effected by PARAGON designed transmitter.
- 1917-1918 PARAGON acknowledged supreme on Western Front.
- 1921 First Trans-Atlantic Amateur Reception effected with PARAGON receiving equipment, at which time 27 different amateurs scattered thruout the Eastern section of the United States registered signals at Ardrossan, Scotland—3500 miles.

THERE'S A REASON!

The Adams-Morgan Company

Manufacturers

UPPER MONTCLAIR, N. J.

RHAMSTINE*

Announces A

RADIO FREQUENCY TRANSFORMER

Once more Rhamstine* has satisfied a definite radio requirement. The Rhamstine* Radio Frequency Transformer is now available to the many thousands of radio enthusiasts who have been waiting for a guaranteed product, made to a fixed standard in quality, and sold at a reasonable price. The type 1 R.F. Transformer complete with special base mounting sells at \$4.50. While it has a range of 200 to 500 meters it is especially well-suited for the wave-lengths of the present broad-casting services.

Consistently good engineering has been followed in its design and by comparison it is the most attractive transformer in appearance that has ever been offered.

Complete circuit diagram is sent with each unit.



Pat. Apd. For

\$4.50

Postage 10c



\$1.75

Postage 6c

RHAMSTINE* Carbon Element POTENTIOMETER

Another new product from the Rhamstine* Shops is the carbon element Potentiometer shown herewith.

By using a carbon potentiometer in the circuit of a radio frequency set best results are obtained. The Rhamstine* Potentiometer is made for panel mounting, is compact and attractively finished. The price is \$1.75. Immediate deliveries.

Manufactured by

J. THOS. RHAMSTINE*

2152 East Larned Street,

Detroit, Mich.

*Maker of Radio Products

Pat. Apd. For

THE RADIO GUILD

adopts

Bradleystat

REGISTERED U. S. PAT. OFF.
PERFECT FILAMENT CONTROL



Price

\$1.85

P.P. 10c

Following is letter from Radio Guild:— Just completed exhaustive tests, using Bradleystat in place of wire rheostats. It is finest filament control we ever used. We specify Bradleystats in all equipment and installations.

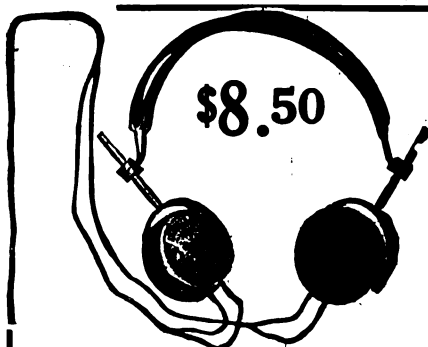
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Allen-Bradley Co.

Electric Controlling Apparatus

277 Greenfield Av., Milwaukee, Wis.

Mfrs. of graphite rheostats for 20 yrs.



\$8.50

Complete Enjoyment of Radio Telephony

is only possible with a Telephone of the very highest standard of efficiency.

Everett Double Radio Phones

have satisfied the most exacting Critics

Supersensitive—Clear—Light

Mechanically Perfect—Moderately priced

AT ALL DEALERS

Everett Electric Corp.

320 BROADWAY,

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Give Your Radio Set the Advantage of

WESTINGHOUSE RADIO BATTERIES



Westinghouse "A" Batteries are especially built for the peculiar requirements of radio work. They deliver a constant, dependable flow of low voltage current. They are built to give long, low-cost service. They demand a minimum of attention.



In the Westinghouse "B" battery you have a *storage* battery for "B" work—the latest development in radio practice. It has all the reliability and dependable performance of a storage battery and none of the disadvantages of a dry cell. The Westinghouse "B" gives a steady continuous, noiseless service. It lasts indefinitely. When exhausted it is easily recharged. The first cost is the last cost.



14¾ in. long
2½ in. wide
3¾ in. high

**WESTINGHOUSE
UNION BATTERY CO.**
Swissvale, Pa.

Don't lose the enjoyment of your Radio by operating under unsatisfactory battery conditions. Get Westinghouse "A" and "B" batteries from your radio dealer or the nearest Westinghouse Battery Service Station.

*"The best
Westinghouse
can build."*

BEING AMONG THE

First



Trade Mark
Registered

—to blaze the trail in the Radio business, the Phila. Wireless Sales Corp. is today recognized by manufacturers and dealers as a leader.

Our entire personnel are practical Radio men, devoting their time to giving a "real service."

We handle only standard Radio Products showing merit.

Our approval stamps it a worthwhile product.

PHILADELPHIA WIRELESS SALES CORP.

Formerly Philadelphia School of Wireless Telegraphy

1533 PINE STREET,

PHILADELPHIA, PA.

A TIMELY WARNING TO THE TRADE

DON'T MAKE THE SAME MISTAKE YOU MADE LAST YEAR. PLACE YOUR FALL ORDERS

NOW



COMMANDER "H"



ENSIGN "H"



ACE



SERGEANT "SS"



BUDDY



MIDGET

THE H. H. EBY MANUFACTURING CO., PHILADELPHIA, PA.

75c
EA.



KELLOGG V-T SOCKET *the durable socket*

Kellogg molded lamp sockets fit all standard four prong based vacuum tubes. Extra heavy solid base $\frac{1}{4}$ inches thick. Four German silver springs with rounded ends firmly held in position in deep grooves, cannot touch mounting surface. Double end nickel plated binding posts. Connections can be made under the socket as well as above. A practically indestructible construction. 75c each, postpaid.

COMPLETE RADIO EQUIPMENT

The item above is merely a sample of the excellent line of radio equipment that is handled by the Apex Radio Company, Inc. All orders for sockets or other standard equipment will be filled the day received. Send two cent stamp for our new price bulletin.

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Oldest and Largest

New
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RETAIL AND WHOLESALE
DISTRIBUTORS—a Complete Line

Our latest BULLETINS show every new practical development in Radio. Our New Building is most up-to-date RADIO plant and store in the West.

REYNOLDS RADIO COMPANY -- INCORPORATED

1534 Glenarm St.,

DENVER, Colo.

Now Ready! **The DICTOGRAPH** **Radio Loud Speaker** *For the Home*

SINCE the first announcement of the development of a Dictograph Radio Loud Speaker, interest on the part of the radio public has run high.

The great Dictograph organization, famous the world over for its marvelously sensitive "Acousticon" for the Deaf and loud-speaking telephones, has concentrated on the perfection of this new Radio Loud Speaker. It is worthy of the Dictograph name—and that means *Standard of the World!*

Here at last is the Loud Speaker you have been waiting for—a Loud Speaker that reproduces every sound—singing, instrumental music and voice—in full volume and with absolutely clear, natural tones, free from distortion or mechanical sounds. It is used with any vacuum tube radio set. No alterations are needed; no extra batteries—you simply plug in and listen.

Assured demand, volume production, and Dictograph resources have made possible a reduction from the price originally announced. Instead of \$25, the price is only **\$20—complete with 5 ft. cord.**

Ask your dealer to show you the Dictograph Radio Loud Speaker. Place your order now to assure early delivery. Dealers can be supplied by their jobbers or our authorized distributors.



Price
\$20

Complete with 5 ft. flexible cord.

The handsome appearance of the Dictograph Radio Loud Speaker harmonizes with any home. It has a highly burnished spun copper bell horn attached to die cast, black enamel tone arm, finished with nickel trimmings. The cabinet is of solid ebony-finished hardwood and mounted upon rubber knobs to avoid marring highly polished tables. It is furnished complete with 5 ft. flexible cord. No extra batteries required.



**The Best
Radio Headset
at any price**

**Price
\$12**

DICTOGRAPH Radio HEAD SET

The Dictograph Radio Head Set has established a standard of quality impossible to secure in any other product—its use on an ordinary receiving set, whether crystal set or vacuum tube receiving unit, improves reception immeasurably. Insist on the Dictograph—Price \$12. 3000 ohms resistance.

The Best Head Set in the World at any Price!

DICTOGRAPH PRODUCTS CORPORATION

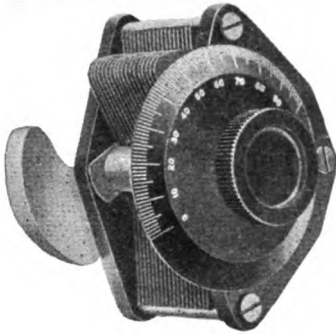
220 WEST 42d STREET,

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81



#3 Price \$4.75

CHELSEA Variable Condenser (DIE-CAST TYPE)

No. 1—.0011 m.f. mounted	\$5.00
No. 2—.0006 m.f. mounted	4.50
No. 3—.0011 m.f. unmounted	4.75
No. 3a—.0011 m.f. unmounted, without dial	4.35
No. 4—.0006 m.f. unmounted	4.25
No. 4a—.0006 m.f. unmounted, without dial	3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates. Unmounted types will fit any panel and are equipped with counterweight.

Guaranteed for circuits up to 1,000 volts.

Amplifying Transformer No. 50

The Chelsea Amplifying Transformer gives the highest amplification possible and at the same time will not squeal, howl, or in any way cause noisy circuits. It is beautiful in design and embodies electrical characteristics unequalled by any. Guaranteed for all circuits up to 500 volts with a high safety factor.

It will not fail in service.

Purchase Chelsea Radio Equipment from your dealer. If he does not carry it send to us.

Write for our new #6 catalog.



Price \$4.50

CHELSEA RADIO CO., 150 FIFTH ST., CHELSEA, MASS.
Manufacturers of Radio Apparatus and Moulders of Bakelite and Condensite



Stromberg-Carlson RADIO HEAD SET

Brings in the long distance tones with accuracy and distinctness.

They give the fullest measure of enjoyment because of the quality of the tones. Convenient and comfortable. The construction of the Stromberg-Carlson Head Set allows simultaneous use by two observers.

Price \$7.50 each f.a.b. Rochester, including two head set receivers, head band and forked 5-foot cord.

Send for our Free Bulletin No. 1030-Q describing the No. 2-A Radio Head Set and other superior apparatus of our manufacture.

STROMBERG-CARLSON
TELEPHONE MFG. CO.
ROCHESTER, NEW YORK

WHITEHOUSE GRID LEAK

an efficient, constant, interchangeable and compact "Grid Leak."

Not affected by Dampness, or Temperature because of the sealed GLASS TUBE

Splendid Proposition to Dealers



Designed to fit any standard base, made in the following resistance values: 0.5; 1.0; 1.5; 2.0; 2.5; 3.

Price - - 70c Each
(Other values to order)

Every one tested and guaranteed. If your dealer does not carry them, send postal money order.

WHITEHOUSE RADIO & MFG. CO.

311 - 89th Street
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DUCK'S RADIO CATALOG No. 16

256
PAGES

Continuously since 1909 Duck's Radio Catalogs have never been equaled for completeness and great wealth of radio data

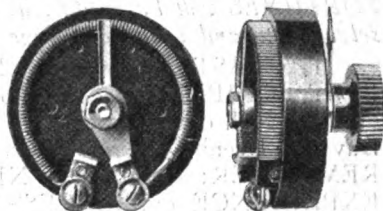
Send 25c in coin carefully wrapped for your copy of this wonderful book, the most unusual and complete catalog ever put between two covers. Not sent otherwise. Enormous cost and tremendous demand prevent distribution at a less retainer.

Over 50 pages of latest hook-ups (wiring diagrams) and invaluable and up-to-date data and information on radio. Not only a catalog, but a wonderful textbook on radio.

Never in the history of radio has there been such a catalog. The radio data and diagrams embracing upwards of 50 pages give the experimenter more valuable and up-to-date information than will be found in many textbooks selling for \$2; and \$1 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth-while radio goods found in this great catalog.

*Duck Products have stood the test of time
The largest line in America---58 complete instruments---62 parts*

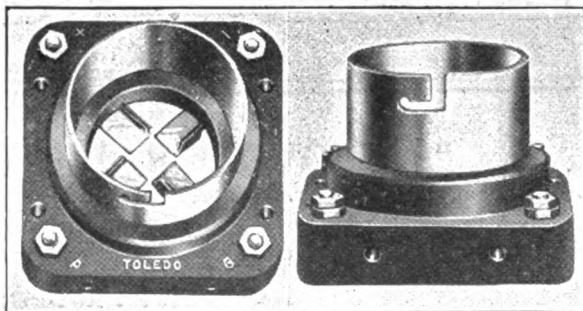
Our new No. A650 Duck Rheostat (at right) has just the necessary amount of resistance to take care of the drop in voltage from the battery when fully charged to the battery at its minimum working voltage. The base is of moulded composition. The resistance element is wound on a black fibre strip, the element being securely fastened in a slot in the base. Contact arm is of phosphor bronze of the proper tension to insure perfect contact and smooth operation. Adjustable to any thickness panel up to $\frac{3}{8}$ inch, $2\frac{1}{4}$ inches in diameter. An exceptional Rheostat at a most popular price. No. A650 Duck Rheostat, \$1. Shipping weight 8 oz.



There are many Duck products that completely dominate all competitive types

No. A666 Duck's Positive Contact Bakelite Tube Socket is beyond doubt the most advanced tube socket on the market today. To our knowledge there is no other type of tube socket that cannot be forcibly criticized from some angle. Either the receptacle does not easily accommodate the varying diameter of the bases of bulbs, or the notch on receptacle is not just right, or the receptacle is easily subjected to breakage, or connections are in an inconvenient place, or, and most important of all, the type and style of the contacts do not insure positive, certain contact without considerable manipulation.

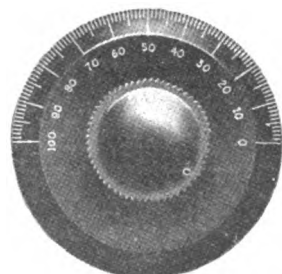
In our new socket all these defects in other bulbs are overcome. The contact springs are so constructed that contact is made, not only on the bottom of the tube terminal, but also on the side of the terminals. When the tube is put into the socket and turned in the notch, the terminal pins on the tube immediately exert a pressure on the side of the phosphor bronze contacts, making a contact that is firm and sure. The receptacle of our socket is of brass, beautifully nickel plated, and moulded into a bakelite base, with all connections on top. No. A666 Duck's Bakelite Tube Socket, \$1. Shipping weight, $\frac{1}{2}$ pound.



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We want live, responsible dealers in every city and town in the United States, both for the sale of our extensive line of radio apparatus and all other worth-while lines of radio goods, on all of which we can quote attractive dealers' discounts. We can offer you facilities and advantages that no other radio house can offer.

Our Nos. 700 and 701 dials and knobs (right) are of genuine black bakelite. Because of the ribbed construction of the dial it will not warp and being of bakelite it will not discolor. The threaded bushing in the dial which holds the knob is perfectly centered, as is the bushing in the knob itself which takes the shaft. This insures a perfect running dial. The bakelite knob is fastened to the dial by means of a threaded bushing. The set screw which secures the knob and dial passes through the composition and also the brass bushing, thus preventing loosening. Either $\frac{1}{4}$ " or $\frac{1}{2}$ " knob and dial, \$1. Shipping weight, 4 ounces.



The WILLIAM B. DUCK CO., 243-245 Superior Street, Toledo, Ohio



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makes possible greater distance reception thru more spark and static interference. No outside aerials. Our new R. F. Transformer lists at \$6.00 each and is the latest and best on the market. We furnish complete sets, too.

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Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.

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Vacuum Tube Detector \$5.50

Including complete cabinet with all instruments wired ready for use.

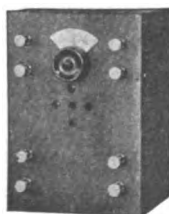
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\$22.50**

With transformers and all other instruments in cabinet, ready for operation. This equipment is of high quality, and distances of as high as 3000 miles have been obtained with ease.

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2000 Ohm receivers \$5.00
**SUPERIOR CRYSTAL
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WITH less adherence to quality, we could make many more Murdock Phones.

Murdock quality has sent the demand for Murdock apparatus far beyond our expectations.

Examine Murdock apparatus at your dealer's. There are no other phones so good at so low a price. *After you have bought*, a 14 day trial privilege assures satisfaction with your purchase.

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No. 56—2000 ohm, \$5.00

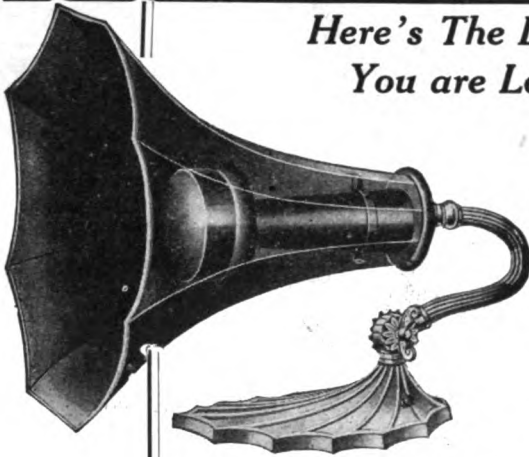
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You can pay more for a loud speaker, but you can't get better satisfaction or better value.

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Complete in every detail. Inverted horn, reflected tone. Equal in volume to any other horn twice its length.

No extras to buy. Nothing to get out of order.

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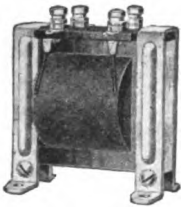
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**You Can
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**Bring out the full clear
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WITH

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Furnished in two types either mounted or unmounted. Coils specially wound with No. 40 and No. 44 wire on a core of the finest rolled Silicon steel.

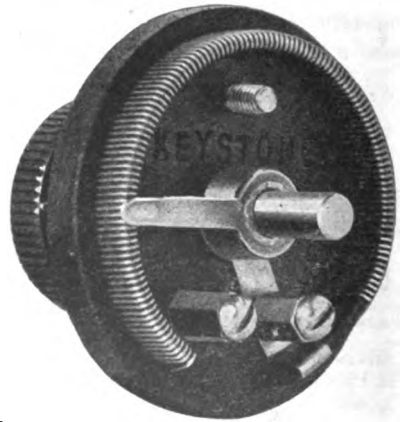
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KEYSTONE FILAMENT RHEOSTAT

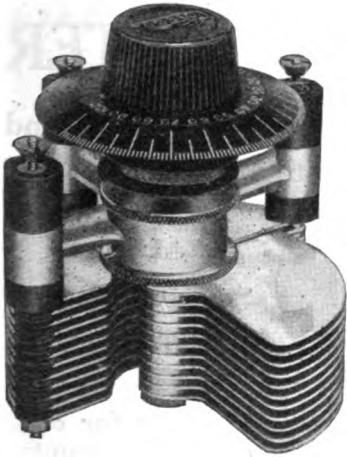


Resistance 6 Ohms.
Carrying Cap. 1½ Amps.
Base, moulded Bakelite.
2¼ In. Diameter.
All metal parts, made of brass, and nickel plated.
Large Knob, with polished pointer.

List Price \$1.00

Manufactured By

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A Better Variable Air Condenser Because it is Made Better

Smooth control, sharp tuning, and permanent, rugged mechanical qualities are the points that distinguish **BETTER** variable air condensers from all others. COTOCO Condensers have established a reputation for low electrical losses and precise mechanical construction.

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This name means **RELIABILITY**—means built to the specifications of Radio specialists—means better results for you. If your dealer cannot supply you, send us his name and we will take care of you.

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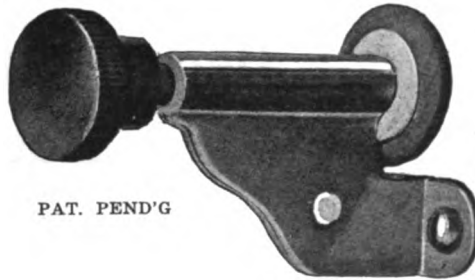
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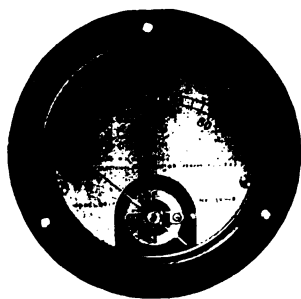
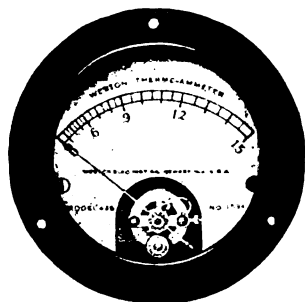


Plate Voltmeter



Antenna Ammeter

Weston electrical instruments

“STANDARD”—the World Over

For your own information you should send for our circular “J” which is authoritative on the need of dependable and accurate indicating instruments in all branches of Radio work. This circular describes the large variety of Weston instruments for this purpose, each having a specific and essential use—and each having been developed after months of pains-taking laboratory experiments and tests.

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"As Good As BRANDES"

It often happens that when a radio enthusiast asks for a Brandes *Matched Tone* headset, he is offered a pair of telephones, which, he is told, are "as good as Brandes."

To be "as good as Brandes" a headset must have behind it the cumulative experience of fourteen years—an experience which reflects itself not only in the high quality and super-sensitiveness and ruggedness of Brandes *Matched Tone* headsets but also in a remarkably low price. Fourteen years' experience is not acquired in a week or two.

*MATCHED TONE is a trade-mark
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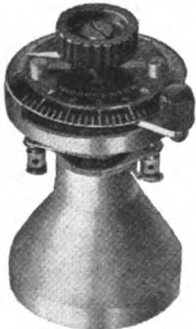
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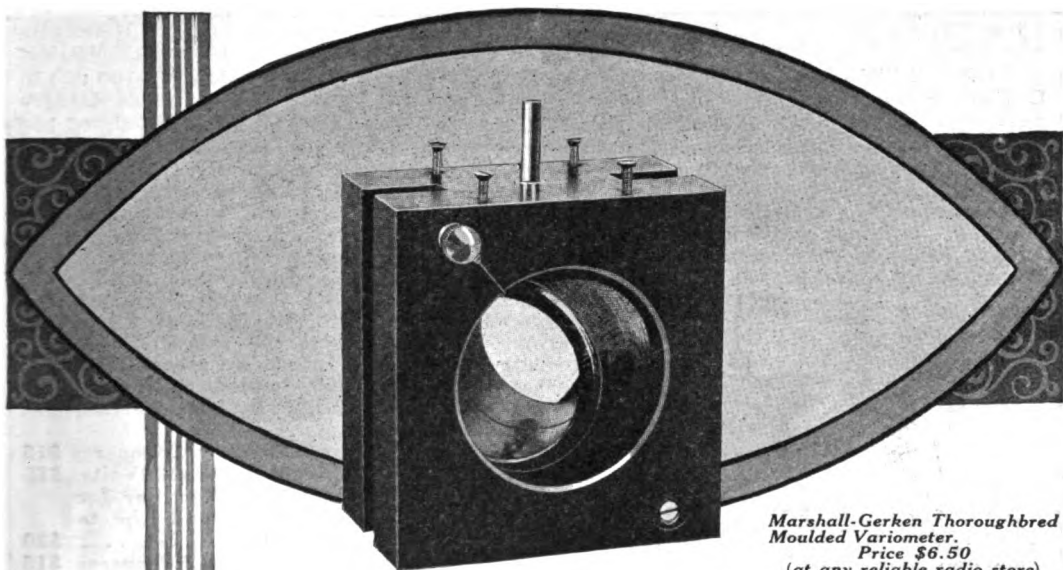
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*Marshall-Gerken Thoroughbred
Moulded Variometer.
Price \$6.50
(at any reliable radio store)*

The Thoroughbred Variometer

*A definite way to secure fine
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CONTINUOUS wave transmitters are so sharply tuned that even a fraction of a turn of inductance makes an appreciable difference in the returns secured. It is therefore impossible to tune your receiving set with any real degree of accuracy so as to throw out undesirable stations and concentrate on the desired broadcasting stations unless you employ a variometer. By turning the knob of a Marshall-Gerken Thoroughbred Variometer a range of wave length values varying from two hundred to six hundred meters may be obtained as desired. You are certain of securing an exceptionally fine adjustment.

Connections are made in the rotating element through brush contacts so that the ball may be continuously rotated without breaking connections. There are no loose contacts to bother with and the rotary action is far more convenient than the movement of sliders along a tuning coil. Marshall-Gerken Thoroughbred Variometers are made in two styles, one for the Plate and one for the Grid. This is a valuable feature found only in these products. Their correct weight makes screws unnecessary for table operation and they are supplied with four screws for panel mounting. You can buy them from your nearest radio store for \$6 50 apiece.

Other Marshall-Gerken Products produced in our large new factory are Vario-Couplers, "Read-'Em" Binding Posts in 17 styles, Two step amplifiers, Non-regenerative sets, Amplifier Panels, Detector Panels.

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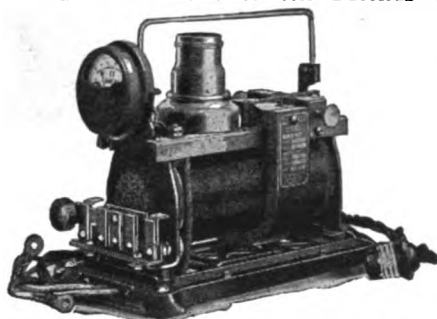
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FOR A FEW CENTS, WITH AN **F-F RADIO RECTIFIER** FROM ANY 100 to 130 Volt 60 Cycle LAMP-SOCKET. Charges All RADIO 6 Volt "A" and "B" STORAGE BATTERIES Up to 120 Volts. It has Unlimited Life at Constant Efficiency, with nothing to Boil over, Burn Out or cause trouble and will charge a dead battery, They charge Automatically, Operating Unattended. Leave Battery where it is, without even disconnecting it; Screw Plug in Lamp Socket, Snap Clips on Battery Terminals; Turn Switch & Battery will be Charged in the Morning. Is it not gratifying to feel that Your Radio Batteries will never fail & You are Always Ready to Receive Radiophone Broadcast Music, Speech & News; never having to be careful of or have to tell Friends that Your Batteries are dead? **F-F BATTERY BOOSTERS** are Complete Compact Self-Contained Portable Full Wave Automatic Magnetic Rectifying Charging Units for 100 to 130 Volt 60 Cycle A.C. No Skill is Required. Infusible Carbon Rectifying Brushes Maintain Uninterrupted Service. They Save You 75c a Charge & Last a Lifetime.



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All Types But B charge Auto Batteries. The Larger Types are for heavy Batteries, or Where Time is limited. Shipping-Weights Complete With Ammeter & Battery Clips, 11 to 15 lbs. Purchase from Dealer, or Mail Check for Prompt Shipment. If via Parcel Post add Postage & Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge Batteries from Farm Lighting Plants & D.C. Circuits & For GROUP CHARGING use our 12 Battery 8 Ampere Full Wave Automatic ROTARY Rectifier Described in FREE Bulletin No. 31A. Order Now or Write Immediately for Free BOOSTER Bulletin No. 31.

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Radio Plug



Pacents Radio Jack



Pacents Twin Adapter



Pacents Multi-Jack



Pacents
Audioformer



Pacents
Universal
Detector
Stand



Pacents
Duo-Lateral
Coil

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The Pacent Trademark is a Safe Buying Guide

It Is Your Guarantee of Quality, Satisfaction and Service

In the ordinary purchases which you make every day, you invariably depend upon some mark of quality as an assurance of value and satisfaction. In buying radio materials the average purchaser is a great deal more dependent upon the reputation of the manufacturer than in buying everyday commodities. A radio instrument may look good and act bad. How much more important it is in this case, therefore, to look for the trademark of a competent, dependable manufacturer. The Pacent trademark on any radio products is an absolute assurance of satisfaction.

What the Pacent Trademark Means to You

It means that the device bearing this trademark was made to fill a definite, important radio need: that is the meaning of PACENT RADIO ESSENTIALS.

It means that the product was originated by a radio expert and has passed the acid test of experience. The Pacent Universal Plug was the FIRST radio plug; the Pacent Jacks were the first radio jacks, and so with the Twin Adapter, Multi-jack and other PACENT RADIO ESSENTIALS. Every Pacent product is also backed up with Mr. Pacent's fifteen years personal experience in the radio industry.

The Pacent trademark means that the product is one of a group generally recognized by radio authorities as leaders in their line. Pacent jacks and plugs are standard with the largest radio manufacturers. Pacent Duo-Lateral Coils, besides being used in standard sets of wide distribution, were approved and used by Major Armstrong as important elements in his new super-regenerative circuit, together with other Pacent products. All PACENT RADIO ESSENTIALS are also approved and sold by the leading radio distributors.

Therefore, when you buy PACENT RADIO ESSENTIALS bearing the Pacent trademark you are absolutely sure that you are getting the best for your money. You are playing SAFE. Don't accept substitutes, imitations or something "just as good." Insist on seeing the Pacent trademark.

DON'T IMPROVISE—PACENTIZE

Send for Descriptive Bulletins

DEALERS AND JOBBERS—The Pacent Sales Policy is to a great extent responsible for the popularity of Pacent products. Write for outline of our Sales Plan.

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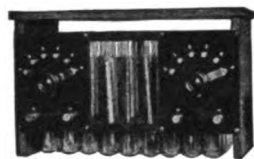
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Storage Batteries

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RADIO



KICO "B" BATTERY

KICO "A" BATTERY

FACTS ABOUT KICO STORAGE "B" BATTERIES—

1. Not an ACID "B" Battery.
2. They eliminate noises caused from "Bs" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries are sold with the privilege of receiving your money back if unsatisfied.
7. Neat, Efficient and Compact.
8. Unlimited life.

		Plain	With Panels
16 cell	22 volts	\$6.50	
24 cell	32 volts	8.00	\$12.00
36 cell	48 volts	10.00	14.00
50 cell	68 volts	12.00	17.00
75 cell	100 volts	16.00	21.00
108 cell	145 volts	21.00	26.00

Literature gladly furnished.

KIMLEY ELECTRIC CO., 290 Winslow Ave., BUFFALO, N. Y.

WHAT'S IN YOUR PHONES ?

It is an electrical principle that the greatest effect will be produced in a magnet when there are the greatest number of ampere turns within a given space.

It is this magnetic effect, and not the resistance caused by the great length of fine wire, that makes for sensitivity in receivers. Remember, when making a purchase of Elwood Head Sets, you are obtaining receivers, with not only full ohmage capacity but with this scientific standard correctly worked out.

We have been manufacturers of Electrical and Radio apparatus since 1905.

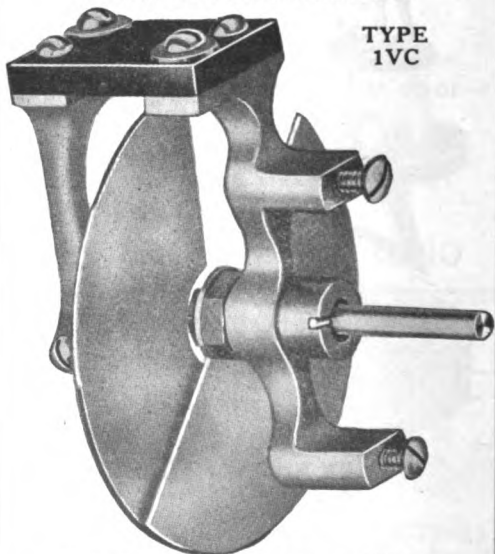
ELWOOD ELECTRIC CO. INC.

2-4 Randall Ave., Bridgeport, Ct.

*We make 3 different types
in 2000 and 3000 ohm sets.*

THE NEW 'WHITE' ADJUSTABLE VERNIER CONDENSER

TYPE
1VC



A NECESSITY FOR SHARP TUNING
Positively noiseless. Highest grade, mechanically and electrically. Exclusive features.

PRICE, at your Dealers or Post Paid.....\$2.50

THE O. C. WHITE COMPANY

Makers of Adjustable Electric Fixtures
15-21 Hermon St., Worcester, Mass.

When Marconi heard the AERIOLA GRAND



Underwood & Underwood



Look for this trademark
at your dealer

The Importance of the Symbol R C A

Crude radio apparatus of a kind can be made even by embryonic organizations. But the vitally important inventions that have made radio the possession of every man, woman and child are those protected by patents owned by the Radio Corporation of America and developed as the result of costly research conducted in the engineering laboratories of the Radio Corporation of America.

The name-plate of a Radio Set is all-important in the purchase of radio apparatus. If it bears the letters "R C A" the public and the dealer are assured that at the time of its introduction it is the highest expression of the advancing art of radio.

Radio Corporation
of America
WORLD WIDE WIRELESS
233 Broadway
New York City
Suite 2068
District Office
10 South La Salle St.
Chicago, Ill.

"It comes closest to the dream I had when I first caught the vision of radio's vast possibilities. It brings the world of music, news and education into the home, fresh from the human voice. It solves the problem of loneliness and isolation.

"The Aeriola Grand is at present the supreme achievement in designing and constructing receiving sets for the home—a product of the research systematically conducted by scientists in the laboratories that constitute part of the R C A organization."

G. Marconi

In tone quality, in simplicity of manipulation the Aeriola Grand is unrivalled. A child can snap the switch and move the single lever that tunes the Aeriola Grand and floods a room with song and speech from the broadcasting station.

Any R C A dealer will be pleased to show you the Aeriola Grand and to let you judge its wonderful tone quality for yourself.

There is an R C A set for every purse—Prices range from \$18 to \$350.



Aeriola
Grand
with
stand
\$350

DEALERS GET SPECIAL PROPOSITION

Send to KLAUS—"Radio Headquarters" for special discount lists and bulletins on apparatus and equipment. Our service department offers dealers assistance and advice on radio problems. We distribute "tested" apparatus. We know the equipment we send you is right. We want all Agents and Dealers to get our special proposition on the best lines of apparatus made.

Get our Prices on these lines of apparatus

Acme
Adams-Morgan
Baldwin
Brandes
Westinghouse

Clapp-Eastham
DeForest
Jewell
Federal
Radio Corporation

Grebe
Moorhead
Murdock
Pacnet



Write today to---

KLAUS RADIO CO.

Dept. 100

Eureka,

Illinois



FIRST TESTED THEN SOLD

RAYMOND RADIO CORPORATION

Manufacturers To the Radio Industries

V. T. Sockets
Rheostats
(Plain And Vernier)
Variable Condensers
Etc.

Executive Offices:
309 Lafayette St.,
New York City
Works:
Farmingdale, L. I.

Control Panel Units
Crystal Detector Sets
Vacuum Tube Sets
Storage B Batteries
Etc.

RF AMPLIFICATION

Following makes of R.F. transformers in stock. Immediate delivery prepaid at standard list prices.

DX
MU-RAD
GA
COTO-COIL
RADIO CORP.

Largest stock of parts and accessories in Piedmont Virginia or Carolina.

CLARK ELECTRIC CO.
545 Main Street, Danville, Va.

WRITE US FOR RIGHT PRICES

The best of apparatus and supplies at reasonable prices. We sell direct to the amateur, Grebe, Murdock, DeForest, Acme, Baldwin, Jewell, Brandes and other high grade lines. Tell us your needs and let us quote prices and delivery.

Write to Us Today

Garber Radio Electric Co.
Metamora, Ill.

Acme Wire in the Radio Field

Radio manufacturers will find in Acme Wire and Acme coil windings that high quality which has become recognized by makers of standard lines of electrical apparatus.

Experience in these old-established lines coupled with laboratory research has perfected the important details necessary to the production of the very fine sizes of magnet wire 40 to 44 B. & S. Gauge and the corresponding fine-wire coil windings.

Audio Amplifying Transformer Windings

Made exactly to specifications, using paper between layers of enameled or silk wire.

Radio Frequency Windings

Magnet Windings for Head Phones

Silk- and Cotton-Covered Magnet Wires

For winding Tuning Coils, Variometers, Vario-Couplers, Inductances and Transformers in all B. & S. gauge sizes from No. 8 to No. 44.

Enameled Magnet Wire

All standard sizes from No. 8 to No. 44 B. & S. gauge.

Enameled Antenna Wire

Made in single conductor or the new stranded cable. This is made of seven No. 22 B. & S. enameled wires twisted together into a cable.

Flexible Varnished Tubing ("Spaghetti")

High dielectric strength; maximum flexibility; perfectly smooth finish; oil-water- and acid-proof. Made in all standard sizes, black or yellow. Special sizes or colors to order.

We shall be glad to co-operate with any manufacturer of Radio Apparatus on any problems involving the application of magnetic wire or coil windings.

THE ACME WIRE CO., New Haven, Conn.
New York Cleveland Chicago

Acme Radio Users

Acme Apparatus Co.
Adams-Morgan Co.
Atwater Kent Mfg. Co.
Auth Electrical Specialty Co.
Chicago Telephone Mfg. Co.
Connecticut Telephone & Electric Co.
Chas. Cory & Son, Inc.
Dictograph Products Co.
Eisemann Magneto Co.
Electrical Products Mfg. Co.
Elwood Electric Co.
Federal Telephone & Telegraph Co.
General Radio Co.
A. C. Gilbert Co.
Holtzer Cabot Electric Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
Standard Transformer Co.
States Co.
Thordarson Mfg. Co.
Wells Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Acme Wire Products

"Enamelite," plain enameled Magnet Wire; "Cottonite," Cotton-covered Enamelite; "Silkenite," Silk-covered Enamelite; Single and Double Cotton Magnet Wire. Single and Double Silk Magnet Wire. Also a complete organization for the winding of coils in large production quantities.

Acme Electrical Insulations

Flexible varnished tubing in all sizes and colors; standard or special.

Acme Radio Specialties

Audio Transformer windings.

Radio Frequency windings.
Magnet windings for Head Sets.

Enameled wire—especially the finest sizes, 40-44 B & S gauge. Silk and cotton covered magnet wire.

Enameled Aerial wire—single wire and stranded.

Illustrated Catalog will be sent upon request to Purchasing Agents and Engineers

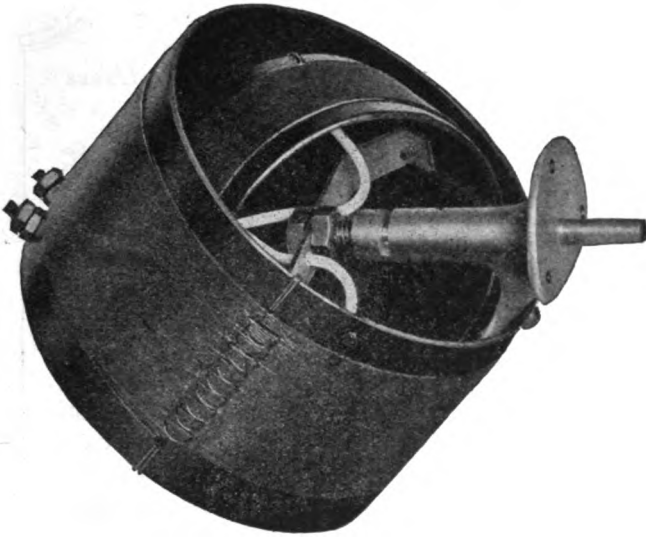


Acme Wire

"It goes in the space"

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

THE LORAIN VARIOCOUPLER



The Coupler With the PERFECT Mounting
(Pat. Pend.)

If your dealer can not supply you, order direct. Dealers—Write for our attractive proposition on Lorain Couplers

LORAIN RADIO SUPPLY CO.

Lorain, Ohio

Specifications

Stator and Rotor wound with #22 DSC on Formica tubes.

Stator—60 Turns 10 taps

Rotor—60 turn bank or 30 turn plain winding

Frame—Rugged aluminum casting, supporting both Rotor and Stator and furnishing face for panel mounting.

Shaft— $\frac{1}{4}$ " or $\frac{1}{2}$ " Brass—Runs true with panel, IT DOES NOT WOBBLE

Connections—Flexible, rubber covered. NO LOOSE CONTACTS.

Price—\$5.50—Specify Rotor winding & shaft size when ordering.

Shipping weight 1 lb. Postage extra.

We can also make immediate deliveries on the following:—UV 200 & UV 201 Tubes—R3 Magnavox-Condensite panel—Knobs & dials—Brandes Phones—Eveready B Batteries—McLean storage bat. Homechargers—Recola Loud Speaker—Sockets—Plug & Jacks—etc.

Mr. Radio Dealer ! !

Are you stocked for the coming Radio Season? Do not wait till the rush is on, place your orders now and be prepared. We are distributors for—

Acme Apparatus Company
Amrad
Federal Tel. & Tel. Company
General Radio Company
Wm. J. Murdock Co.
R. Mitchell & Co.
Klosner Improved Apparatus Co.
Coto-Coil Company
Burgess Batteries
Precision Condensers

We have a complete stock on hand of the above makes and also other popular makes. Let one of our New England representatives call on you, and give us a try with your next order.

JAMES H. JONES

94 Mass. Ave., Boston, Mass.

HERE

RADIO CITIZENS

Complete stocks carried for immediate shipment of the following apparatus:

Grebe Murdock
DeForest Adams-Morgan
Acme Radio Corporation
C. Brandes, Inc.
Federal Telephone & Telegraph Co.

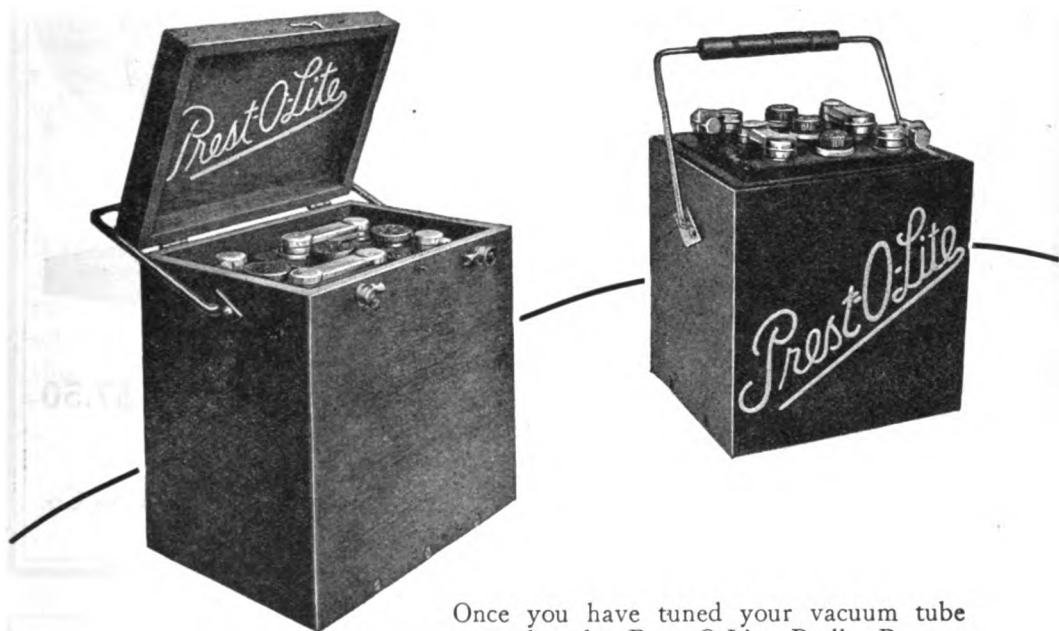
**FREE BULLETINS
PRICE LIST**

Get the new lowest prices on apparatus and supplies. Bulletins and price lists mailed FREE on your request. Send for them today.

Nash Electrical Service Co.
Marshall, Ill.

ADJUST YOUR RADIO BATTERY

-Then Forget About It!



Once you have tuned your vacuum tube properly, the Prest-O-Lite Radio Battery holds it there. Continual adjustments to meet current variations are done away with. The new Prest-O-Lite Radio Battery is a "chip of the old block." Though specially adapted to furnish the steady, uniform rate of discharge required for the vacuum tube, it embodies the same principles that have made Prest-O-Lite Automobile Batteries so popular.

It is a product of the same precision laboratories. It has the same long life. Its plates are Prest-O-Plates.

Buy a battery that you KNOW is right.

Prest-O-Lite RADIO "A" BATTERY

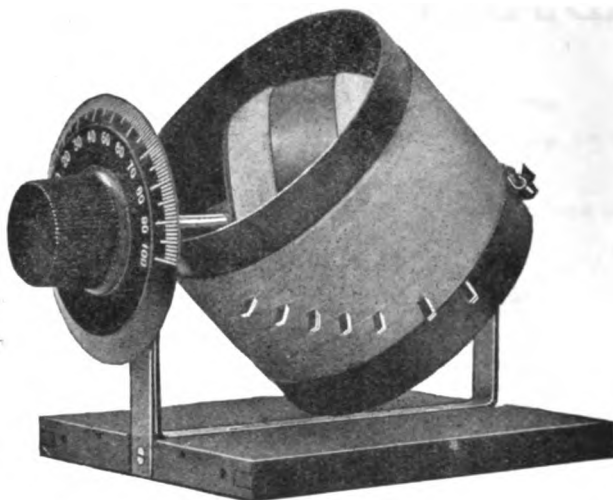
THE PREST-O-LITE COMPANY, Inc.

Carbide & Carbon Bldg., 30 East 42nd St., N. Y.

Eighth and Brannan Streets, San Francisco, Calif. In Canada: Prest-O-Lite Co. of Canada, Ltd., Toronto
ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

99

A HIGHLY efficient instrument with fine tuning qualities. Designed and manufactured under supervision of expert radio engineers. Made of high-grade material throughout. No moving contacts — connections made through hollow shaft to patented clips.



AMPCO VARIO-COUPLER - - Price \$7.50

Mounted on Mahogany Base

Manufactured by

AMERICAN Pattern, Foundry & Machine Co.
82 Church Street, New York

WE'RE OLD-TIMERS

We take justifiable pride in our position as one of the pioneers in radio sales. Since 1916 we have been actively engaged in the radio business and have built up a reputation for fair-dealing and service which is rightly envied.

Doubtless many of our friends and customers have noted the absence of our advertisements in this magazine during the past few months. This was necessitated because of the vast number of orders which we had on hand, many of which we could not fill. We simply could not take care of additional business and accordingly ceased advertising temporarily.

However, we are still alive and going strong and during the summer months have had an opportunity to stock up fully in anticipation of a tremendous fall and winter business. A new catalogue has just been printed which we shall distribute to those interested at our cost price of 10c. Stamps or coin will be accepted.

ELECTRICAL SPECIALTY CO.,

83 E. Long St., Columbus, Ohio

"SHRAMCO PRODUCTS"

Amateurs: Send 5c in stamps today for our new Catalogue L showing complete line of parts, raw materials and high grade apparatus.

Dealers: Write for our attractive proposition.

The Shotton Radio Mfg. Co.,
INCORPORATED
8 Market St., Albany, N. Y.

J-RAY Receiving Apparatus

SEND FOR BULLETINS

J-RAY MFG. CO.
1618 Chestnut St., St. Louis, Mo.



THIS IS THE MARK OF SERVICE TO SEEK IN RADIO.

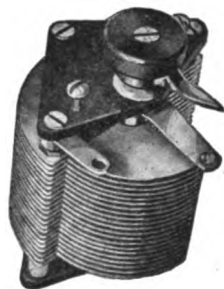
The less experienced you are in radio the more particular you should be in your choice of your equipment.

Whether you expect to be guided by your own experience or you choose to profit by the experience of others, bear this in mind:

It has always been the policy of this company to sell something besides the actual "SIGNAL" radio and wireless material itself. That something is **SERVICE** to customers.

In fewest words, when you buy SIGNAL products, you know that you have permanently hooked up to a real Radio Service Station; that SIGNAL engineers and specialists are always at your call, to help you secure best results from your installation.

In this day and age when much radio equipment is made to **sell**—rather than to **serve**—the beginner and advanced amateur should go **behind** the **product itself**—to the maker. If you apply Third Degree methods to your selection of such material, your search will take you straight to "SIGNAL."



We this month reproduce a picture of the **Signal Back Mounted Variable Condenser** because you cannot be told too often nor too much about it. Just one item of the Signal Line, it is quality through and through, built to be banged around more than the ordinary type condenser. We build Signal Condensers in three models to permit mounting on panels from $\frac{1}{8}$ to $\frac{3}{8}$ inches thick. Each instrument has metal scale calibrated to 180° . Knob and pointer are removable. The material in the aluminum plates is thicker than usual.

**SIGNAL ELECTRIC
MANUFACTURING
COMPANY**
Menominee, Michigan

For convenience use this coupon; get it off to us today.

COUPON

Send me the new Signal Wireless Bulletin W.

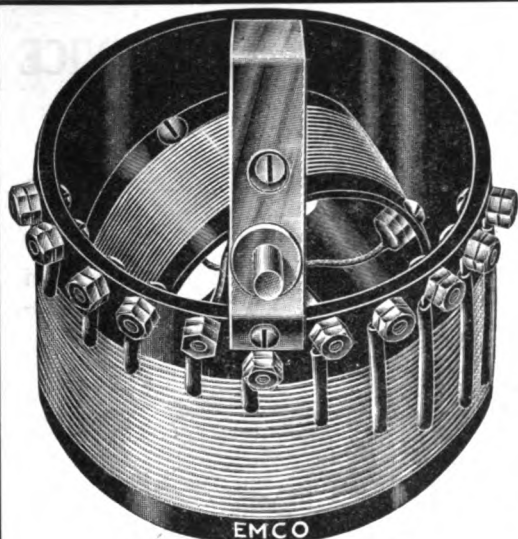
Name

Company

City

State

QST



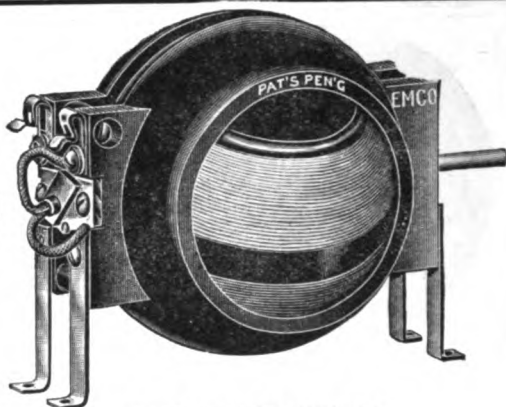
EMCO VARIO-COUPLER

Specifications

This coupler is of the 180 degree type, embodying new and original ideas. Rotor and stator of bakelite-dilecto tubing. All metal parts of brass.

Primary wound with 35 turns of #19 DCC wire with taps brought out every six turns for the first 30 turns and every turn thereafter. This arrangement utilizes every turn. Secondary wound with #22 SCC wire, 180 degree stop. No bearing contact. Note by the illustration that it is very simple to mount and connect.

Type E.M. 8 Emco Vario-Coupler Price \$6.50



EMCO VARIOMETER

Specifications

Rotor and stators moulded of pure unadulterated bakelite that will not warp, shrink, or change color as hard rubber and other substitutes do. Intense heat does not affect it in any way.

Removable legs for panel mounting. All metal parts of brass. Shaft $\frac{1}{4}$ inch.

No sliding or bearing contacts, wires brought through hollow tube in rear. No shellac or other injurious solutions used. Fahnestock clips are provided for connections. 180 degree stop.

Type E.M. 7 Emco Variometer Price \$7.50

If your dealer is not supplied, write direct giving dealers name.

Emco Radio Products Company

1856 85th Street,

Brooklyn, N. Y.

RADIOIST

↓ WE ARE NOW ↓
L LOCATED IN OUR **L**
O NEW HOME AND CAN **O**
O PROMISE OUR USUAL **O**
K SERVICE **K**

**ORDERS SHIPPED SAME DAY
 THEY ARE RECEIVED**

**A complete stock of parts and
 finished apparatus.**

ROSE RADIO SUPPLY

Pioneers in the Radio Field

129 CAMP ST., NEW ORLEANS

Send 10c for latest catalogue

2nd DISTRICT OPS!

**Have you seen the 2nd. District
 magazine?**

**Do you know what your friends
 are doing?**

**Are you interested in club doings
 and real "How to Make It"
 articles?**

**IF SO, you had better subscribe
 NOW to**

THE MODULATOR

**It's only a dollar a year, or ten
 cents a copy. Published every
 month.**

THE MODULATOR

120 Liberty St., New York, N. Y.

Tune In With These Real Radio Batteries

Hook up a 6-volt Willard *All-Rubber* Radio "A" Battery to your filament circuit, and two or more 24-volt *Threaded Rubber* Radio "B" Batteries to your plate circuit. Then note the difference in the way your set stays tuned—in the freedom from hissing and frying noises. These batteries give you results because they are *built for radio*.

The 6-volt

All Rubber "A" Battery

has special heavy Radio plates—Threaded Rubber Insulation—one-piece rubber container, which eliminates all possibility of leakage.

The 24-volt

Threaded Rubber "B" Battery

has glass jars, well separated to prevent leakage—Threaded Rubber Insulation—rubber screw-caps. Holds its charge, and is easily recharged.

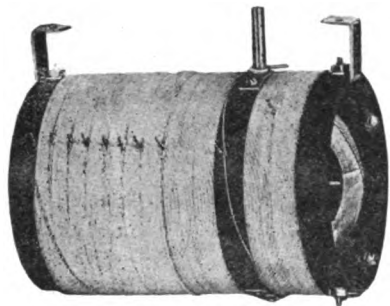
WILLARD STORAGE BATTERY COMPANY, Cleveland, Ohio
Made in Canada by the Willard Storage Battery Co. of Canada, Ltd., Toronto, Ont.



The image features a large, stylized 'Willard' logo in the background. In the foreground, there are two battery units. On the left is a 'RADIO' battery, which is a single large unit with a circular logo that reads 'THREAD-RUBBER Willard INSULATION'. To its right is a 'THREADED RUBBER BATTERY', which consists of several smaller glass jars arranged in a row, each with a screw cap. A circular logo on the base of this unit also reads 'THREAD-RUBBER Willard'. To the right of the batteries, there is a block of text.

Write for particulars about the Willard "A" and "B" Radio Batteries, or ask the nearest Willard Battery Dealer.

LIST
\$9.00
PRICE



WARNING There are many imitations of the "ALL-WAVE" Coupler on the market; Every genuine "ALL WAVE" Coupler has our trade mark on the rotor, this is your protection—look for it. Also see that you get six efficient hookups with each Coupler FREE.

The New
"ALL WAVE"
COMBINATION FLAT & BANK WOUND
Coupler

ENTIRELY ELIMINATES the use of ALL VARIOMETERS, VARIOCOUPERS and LOADING COILS.

Permits the building of the most compact and efficient receiver at a considerably lower cost.

**Guaranteed
Wave Length
150 to 3000 Meters**

We guarantee the "ALL WAVE" Coupler (with a money back guarantee) to give maximum results for long or short wave long distance selective reception.

If your dealer cannot supply you, send us his name and your order; we will supply you direct or through him.

MANUFACTURED BY

Capitol Phonolier Corporation

60 Lafayette Street,

New York, N. Y.

**Our New Price List is
Ready. Get Your Copy**

Immediate deliveries on
Radio Corporation
Magnavox
Grebe
Amrad
Clapp-Eastham
Tuska
Formica
Thordarson
Remler
Cunningham
Frost
Federal
& Others

Detroit Electric Co.

113-115 E. Jefferson Ave.

DETROIT,

MICH.

SOMERVILLE

PRODUCTS LEND DISTINCTION TO THE CUSTOM-BUILT SET.

THEY HAVE STOOD THE TEST OF COMPETITION SINCE 1917.

DESIGN DETAIL AND QUALITY OF MATERIAL COUPLED WITH FAIR PRICE AND TRUTHFUL ADVERTISING ARE PRIME FACTORS IN ESTABLISHING POPULARITY.

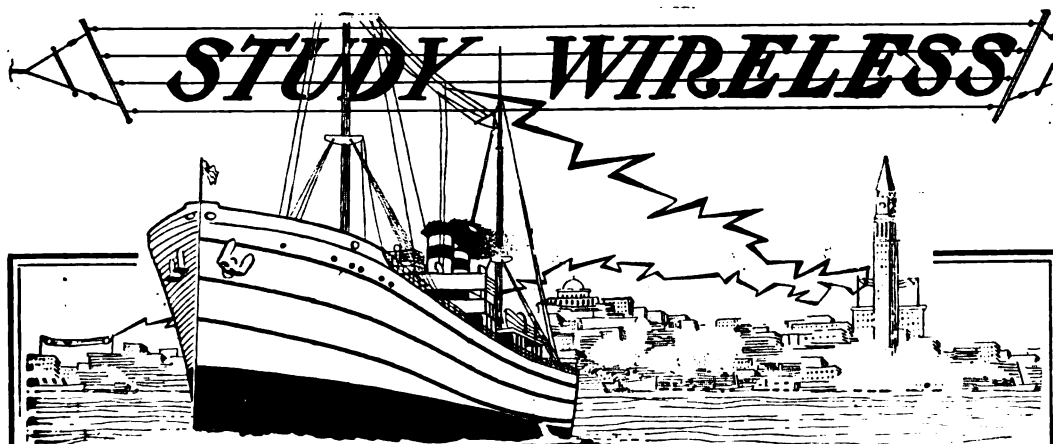
"OLD TIME" AMATEURS INSIST ON GETTING PRODUCTS MADE BY AN ESTABLISHED RADIO COMPANY.

THEY HELP TO STABILIZE RADIO BY ENCOURAGING ORIGINATORS AND SHUNNING IMITATORS.

WHETHER YOU BUY FROM A DEALER OR BY MAIL, FROM SOMERVILLE RADIO STORES, 43 CORNHILL, BOSTON,

SPECIFY

SOMERVILLE



Positions Guaranteed Our Graduates!

Our classroom equipment includes 1KW Navy Standard Shipping Board Set and 5 latest type complete commercial transmitters,—more, and better type apparatus than any other New England school.

AS the recognized leading Radio School of New England, our relations with steamship lines, operating companies and the Radio industry enable us to place our graduates in good paying positions at once.

Besides establishing several records for qualifying our graduates as First Class Operators, we have placed more men in positions in the last 2 years than any other school in New England.

Remember, ours is the oldest Radio School in New England, having been established in 1903 as the Boston School of Telegraphy.

Fall Term Begin September 11. Enroll NOW!

MASS. RADIO and TELEGRAPH SCHOOL
18 BOYLSTON ST. COR. WASHINGTON ST., BOSTON
 Dept. B *Send for FREE Catalogue* Dept. B

DEALERS

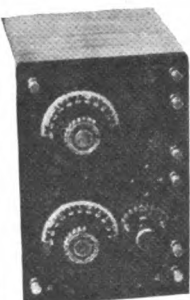
We are now making prompt deliveries on the following lines:

ACME	MURDOCK
GREBE	FADA
BALDWIN PHONES	FEDERAL

and many other lines including the well known Radio Shop products.

Write for our Discount sheet Q.

The Radio Shop of Newark
41 So. Orange Ave., Newark, N. J.

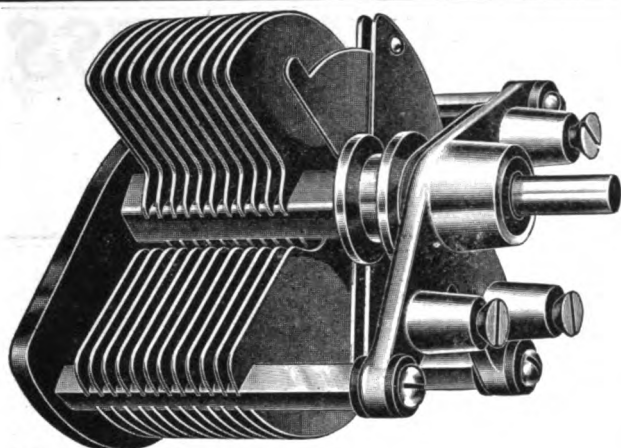


Costlier Receivers? Yes. But None Better than The OKAY VT at \$26.50 delivered. To the novice this set will especially appeal—its beauty of design—the clear sharp tones—the ease of operation, the moderate price, is most convincing evidence of its popularity. WSB, KDKA, WDAF, WCK etc. are picked up nightly without amplification from our laboratories. The Okay will meet your every requirement.

Specifications
 Panel: Condensite Dull, Cabinet: Dk. Mahogany, Cond.: 23 Plate, Rheostat: Tucker, Dials: Bakelite, Inductance: Wound on Fibre, Posts: Nickel-plated insert, Switch: Shunt.

Okay Radio App. Co. Brazil, Ind.
 \$26.50 del. Distributors—Jobbers—Dealers Write

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



Alden L. McMurtry Licensee

THE SEXTON CONDENSER

With Vernier control entirely eliminates the necessity for delicate tuning of a receiving set.

The single knob and dial control makes it possible for anyone to obtain desired results.

PRICE—43 PLATE\$7.50

PRICE—23 PLATE 7.00

PRICE—11 PLATE 6.50

Complete information upon request. Send POSTAL CARD stating type of Receiving Set.

Hartford Instrument Co., Inc., Hartford, Conn.

F E S C O

PRODUCTS QUALITY SERVICE

Phones
FROST
MURDOCK
BRANDES
BALDWIN
WEST. ELEC.

Bulbs
UV200
UV201
UV202
UV203
WD11

Variable Condensers

43 Plate	001	\$4.75
23 Plate	005	 4.00
11 Plate	0025	 3.25
3 Plate	00004	 2.25

with dial add 75c.

Dial. Genuine Bakelite \$1.00
1/4 or 3/16 Shaft

STERN & COMPANY, Inc.
308 Asylum St., Hartford, Conn.

NOVO "B" BATTERIES FOR RADIO

22½-45 & 105 VOLTS



**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.

424-438 W. 33rd ST.
NEW YORK

531 SO. DEARBORN ST., CHICAGO.

RADIO REALITIES

Our price list, mailed FREE on request. Contains complete lists of reliable Radio Sets and parts—every article carrying our guarantee. Mail orders given prompt attention.

Write today—Special Terms for Dealers

**THE KLEIN RADIO & ELECTRICAL
SUPPLY CO.**

48 Fulton St. and 34 Park Place NEW YORK, N. Y.



REMEMBER that although there are several makes of honeycomb coils on the market, there is only one line — the DeForest—which is **duo-lateral**.

HONEYCOMB coils were used by Armstrong in his three-tube

circuit, and the convenience and efficiency of the DeForest method of mounting, with the new spring plugs, greatly facilitate the adjustments which are necessary before this circuit can be made to operate. Insist on DeForest DL Coils and be sure of dependability.

DEFOREST RADIO TEL. & TEL. CO., JERSEY CITY, N. J.



SORSINC

It Will Pay You
to buy where you see this sign

JOY-KELSEY CORPORATION
Manufacturers
RADIO EQUIPMENT
4021 West Kinzie St. Chicago Ill.

Armstrong Super Regenerative Circuit

Complete blue-print and descriptive matter \$0.25
400 turn Honey-comb Coils (unmounted) 1.00
1250 turn Honey-comb Coils (unmounted) 2.40
1500 turn Honey-comb Coils (unmounted) 2.80

Add \$1.00 to above prices for mounted coils.

We can also supply the necessary choke coils and 12,000 ohm resistances used in this circuit.

Dealers write for Discounts

FRANKLIN RADIO MFG. CO.
711 Penn Ave., Wilksburg, Pa.



RADIO PANELS AND PARTS

Start your set right. Pay particular attention to "insulation." Get a good panel and dependable parts. To make sure that you do get them look for the dealer displaying this sign:

CONDENSITE CELORON RADIO PANEL SERVICE

Condensite Celoron panels and parts are right. You can bank on them, for this strong, handsome, waterproof material (approved by the Navy Department, Department of Engineering) is extremely high in surface and volume resistivity and dielectric strength. It machines readily, engraves without "feathering," and takes a beautiful natural finish—polished or dull. This is why it is so widely used for panels, tube bases, mountings, variable condenser endplates, tubes, dials, knobs, handles, bushings, etc. We can machine all of these parts to your specifications.

Send today for our Radio Panel Guide

Are you an enthusiast? This Guide describes our panels in detail—tells how they are made and what they cost.

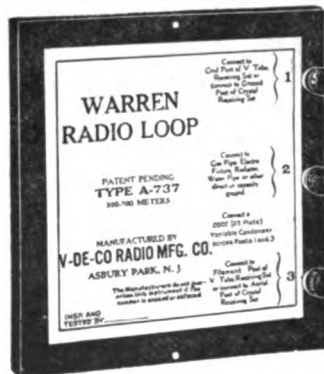
Are you a radio dealer? Learn about Celoron Radio Panel Service and how easily and profitably it enables you to supply your customers with panels and parts fully machined and engraved to their specifications. Write for our Special Dealer's Proposition today.

Diamond State Fibre Co.,
Bridgeport (near Philadelphia) Pa.
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In Canada, Diamond State Fibre Co., of
Canada, Ltd., Toronto

Warren Radio Loop

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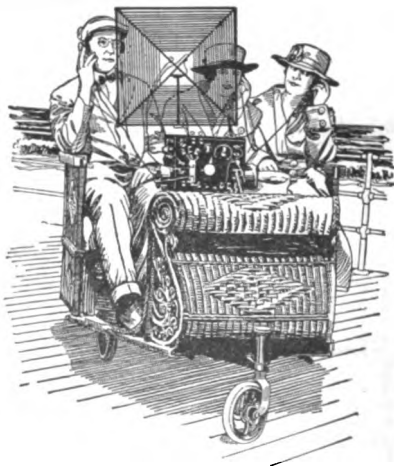
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If Dad says—

"NO AERIAL ON THIS HOUSE"
don't allow his QRM to worry you but purchase a

WARREN RADIO LOOP

The LOOP that made the Radio Roller Chair famous on the Boardwalk at Asbury Park, N. J. Is just the thing for an apartment or den. Is light in weight and easily portable. Is produced under a new principle of winding. Is wholly enclosed, thereby protecting the winding. Is used in place of an outside aerial. Is adapted for receiving in moving vehicles. Takes the "tic" from static. Eliminates all danger from lightning. Can be used with any receiving instrument. Can be used without tuner.



This picture of the Radio Roller Chair showing the Warren Radio LOOP was used as cover designs on "Wireless Age" and "Radio News" and featured in many other magazines and newspapers in the United States.

Send your order through your dealer or direct to us with his name.

Type-A-737 (300-700 meters).....\$10.00
Type-A-7236 (175-1000 meters)..... 12.00

V-DE-CO RADIO MFG. CO.

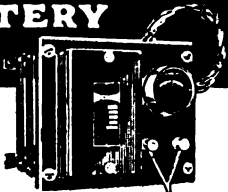
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Send for Bulletin—No. A101

HOMCHARGE YOUR BATTERY

for A Nickel

No muss, trouble,
dirt—no moving
of batteries—loss
of time—no ef-
fort on your part
—no technical or professional knowl-
edge needed.



THE HOMCHARGER

successfully meets all charging con-
ditions, and is the only rectifier com-
bining the following essential Hom-
charging features.

1. Self polarizing. Connect battery either way and it will always charge. No danger of reverse charging, ruined battery or burnt out Rectifier.
2. No delicate bulbs to break or burn out. Only one moving and two wearing parts. These are replaceable as a unit, after thousands of hours use, at small cost. Cannot be injured by rough handling.
3. Operation stops and consumption of current ceases immediately upon disconnecting battery.
4. The only charger costing less than \$100.00 that will fully charge a battery over night. Gives battery a taper charge—exactly as recommended by battery manufacturers. Guaranteed not to harm your battery even though left connected indefinitely.
5. Highest efficiency of any three or six cell charger made.
6. No danger of fire. Approved by the Underwriters.

ATTENTION MOTORISTS

Will charge your auto battery as well as radio battery. Send for Bulletin No. 58 for further information.

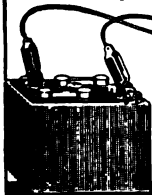
For sale by all radio, electrical and accessory dealers or shipped express prepaid for purchase price.....\$18.50

\$20 West of the Rockies

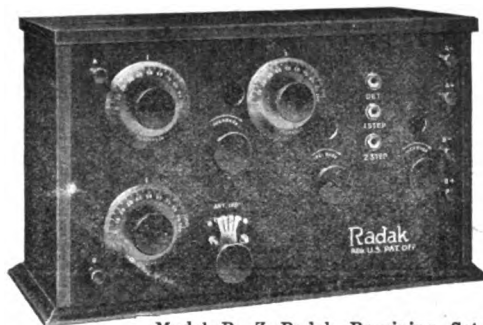
The Automatic Electrical Devices Co.

127 West Third St., Cincinnati, Ohio

Branch offices: New York, Chicago, Pitts-
burgh, Los Angeles, New Orleans, Detroit,
Philadelphia, Baltimore, Dallas, Kansas City,
St. Louis.



*Largest Manufacturers
of Rectifiers in the World*



Model R. Z. Radak Receiving Set.
Licensed under Armstrong U. S. Pat. 1118149

This Latest Radak Set a Big Advance in Simplification

Regenerative receiver and two stages of ampli-
fication "hooked-up" in one complete unit—

Telephone jack connections, in place of binding
posts—

A range of response to wave-lengths as high as
8000 meters—

An ease of tuning that surprises even the hardened
radio "fan"—

A handsomely finished cabinet that harmonizes with
home surroundings—

These are only a few of the separate improvements
which contribute to this new set's success.

But even the enumeration of all the separate advan-
tages can give you no idea of the surprising results
you will obtain in using it. Distances seem to melt
like mist—you hardly believe your ears until you
verify the published programs. The loudness of
signals—especially when used with a loud speaker,—
the clearness and lack of distortion, continue to
amaze you.

Only the experience of over sixteen years' exclu-
sive specialization in radio could produce such a set
as the Model R Z Radak Receiver. Ask to hear it at
the store where you usually buy electrical goods.
If the dealer doesn't now carry Radak radio equip-
ment, his jobber can supply him.

Radio Catalog describing this set and other Radak
equipment by mail 6c.

"MORE THAN YOU RECOMMEND"

Marshall, Missouri.

"About three weeks ago I purchased your
HR Tuner Unit * * * I want to say right
here that it is more than you recommend in your
advertisements in the radio papers. It is a
wonder! * * * I get the following stations
so far: Pittsburgh, Pa., Schenectady, N. Y.,
Detroit, Mich., Chicago, Ill., Tulsa, Okla.,
Guthrie, Okla., Columbia, Mo., Slater, Mo., Car-
rolton, Mo., Kansas City, Mo., Denver, Colo.,
and several other places * * * I heard a great
concert last night in Convention Hall at Kansas
City, Mo., which is over a hundred miles from
here. Every member of the orchestra and voice
numbers came in plain, and my neighbors were
astounded at the clearness of the music."

Frank Q. T. Uta.

CLAPP-EASTHAM COMPANY

105 MAIN STREET, CAMBRIDGE, MASS.

Oldest, Largest Manufacturers of Radio Equipment
Exclusively. Established 1906

Trade Mark **BKUMA YRLSBUG** Reg. Ap. For
Attentive Beginners Who Use

Dodge One Dollar Radio Short Cut DO ARRIVE

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Earle E. Lockwood, Norwalk, Conn.
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Memorized Code in 40 Minutes

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Memorized code in few hours

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Some Learned Code, Passed Exam, Won License All in One Week. Fact Reported to Enlighten Others Struggling With ABC Methods. Send ONE DIME for Honor Roll Dodge Short-Cut Beginners Now Licensed Operators—Covers Ten Radio Districts.

INVESTIGATE—SAVE TIME AND EXPENSE—GET RESULTS

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Wireless Amateurs Attention!

If you want service, order from us. We carry a large stock or High Grade Wireless Apparatus of our own and other manufacturers.

SPECIAL!

Vacuum Tube Sockets.....	\$1.25
Rheostats.....	1.25
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Rasco Dials.....	.60
Rubber Binding Posts.....	.20
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Lateral Wound Coils. All Sizes	

SEND 5c FOR OUR NEW PRICE LIST

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THE ELECTRICAL SHOP

787 Queen St. West, Toronto, Ont.

3000 OHM SETS, \$4.50

2000 OHM SETS, \$4.00 1000 OHM SETS, \$3.50

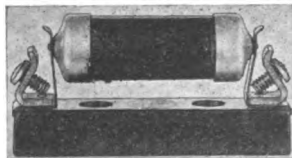
Plus 20c for Postage and Insurance

Satisfaction Guaranteed or Money Back



We mail phones the day your order arrives. Every pair tested, matched, and guaranteed as sensitive as \$8 to \$10 phones. We have no agents or dealers. By ordering direct you save dealer's profits—circular free.

TOWER MFG. CO., Brookline, Mass.
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"BERKSHIRE" RADIO FREQUENCY AMPLIFYING COIL

IRON } 3 SIZES \$2.00 EACH
CORE } 150-700 METERS WITH BASE

CIRCULAR SHOWING CIRCUIT ON REQUEST

BERKSHIRE ELECTRIC CO.
Pittsfield, Mass.

AMATEUR RADIO CALL BOOK

Loose Leaf System, Amateur, Special, Experimental, Technical, Telephone Broadcasting, etc., kept to date monthly.

Postal Card for Particulars.

CITIZENS RADIO SERVICE BUREAU
416 S. Dearborn St., Chicago

*Who's Who and What's What
in Radio Communication*

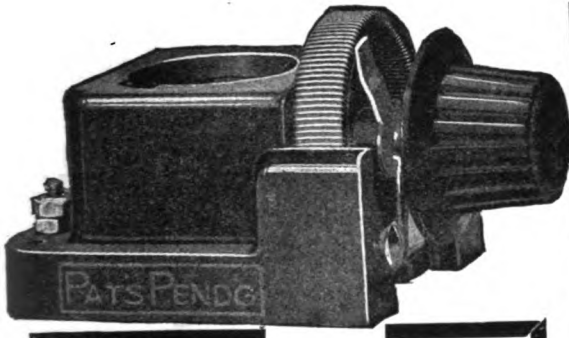
OLIVER S. EVERETT

MAKER OF

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Quotations Furnished Upon Receipt of Specifications

83 OTIS STREET, MEDFORD, MASS.



KING Rheo-Socket

another
Radio Surprise

Price \$3.00 f.o.b. N. Y. C.

Compact, increased efficiency, shorter connections, less wiring. Brings in stations you never heard before. Make this a part of your up-to-date set.

A high grade article in Red Bakelite with phosphor-bronze contacts and alloy resistance wires.

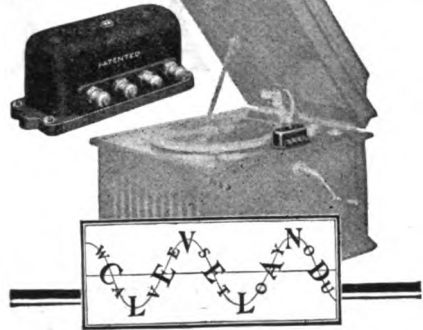
For Base or Panel Mounting

King Am-Pli-Tone
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Manufacturers of the Famous
KING AM-PLI-TONE

Jobbers—wire or write for proposition

Cleveland Dulce-Tone Junior.



RADIO MUSIC PERFECTLY REPRODUCED THROUGH YOUR PHONOGRAPH

The Dulce-Tone Junior converts your phonograph into the finest of loud talkers without detracting in the least from its power to play phonograph records.

The radio music comes to you with cello-like sweetness, even more clearly than that reproduced from your records.

The Dulce-Tone Junior is adaptable to any phonographic instrument. When you consider that you are using the wonderful sound-box, tone-arm and even the needle which has been perfected only after years of experimenting, you can realize the **QUALITY** and **SWEETNESS** of the tone which is so faithfully reproduced through the Dulce-Tone Junior.

Any one can attach the Dulce-Tone Junior in a few minutes. To operate, simply swing the tone arm allowing the needle to rest on the small center element of the Dulce-Tone Junior. This ingenious instrument eliminates the necessity of numerous expensive head-phones when entertaining a roomfull of people—is a true economy.

The Dulce-Tone Junior is the instrument of the century—an instrument that will improve any radio set. Put one on your phonograph today and realize the possibilities of radio music for quality of tone.

RETAIL PRICE..... ONLY \$15.00
(\$17.50 West of the Rockies)

If your dealer does not handle the Dulce-Tone Junior, fill out the coupon below, mail it with one dollar and we will forward this wonder instrument to you C.O.D. at \$14.00.

The Cleveland Radio Mfg. Co
241 St. Claire Ave., N. E. Cleveland, Ohio
Sole Licensees under KAEHNI Circuit Inventions
and Patent Applications

COUPON

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241 St. Claire Ave., N. E.,
Cleveland, Ohio.

Enclosed find one dollar for which send me a Dulce-Tone Junior (\$14.00 balance due C.O.D.) Send me your folder entitled "Waves to You Through Your Phonograph."

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111

An Open Letter to Dealer, Expert

RADIO is fast outgrowing stirring articles on fanciful inventions. It has become a stable business institution which will total fully \$50,000,000 this year.

The future of this industry, its welfare and growth must be safeguarded. Pirating and cut-price tactics, flooding the market with cheap, unsatisfactory apparatus is certainly bringing the gavel of discontent down on the heads of a growing throng of enthusiastic fans.

We in this industry must protect the cause we have labored to build up. To this end the Ray-Di-Co Organization pledges its support and stands "pat" as a pioneer radio institution.

We have held a sympathetic hopeful attitude during the early days of radio experimentation. We now appeal to the fair-minded judgment of practical business and professional men to aid us in rescuing this industry from exploiters of radio junk; rank fly-by-night up-starts, bootleggers and vulgar intruders who menace rather than promote a naturally promising industry.

RAY-DI-CO

Demonstration Rooms, Studio and Laboratory:
1215-17 Leland Ave., Chicago, Ill.

the Radio Jobber, and Amateur

This business has a perfectly just right to be here; a better right to grow, and in this field is legitimate room for new experiments and developments.

But there is no room for hold-up shysters who endeavor to pocket gilt-edge profits through misrepresentations, false claims and defective apparatus.

To the promotion of the cause through personal service, tested apparatus, stabilized list prices and fair profits, we as a corporate body pledge our united support.

We are strongly organized to do our part to promote the cause we have labored to aid through its years of infancy.

Let the good words go forth—pull together—sit tight! Radio is now passing through a period of casual interest and enthusiasm. It will take its place as a dignified institution founded on conservative business principles because it is meeting a universal need.

It is the cause to which I have personally pledged my support because I know its possibilities are unlimited.

LEWIS J. CONRAD, President

ORGANIZATION, Inc.

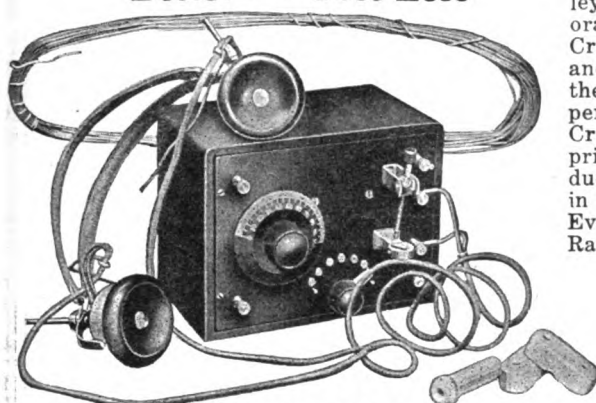
General Offices and Salesrooms:

1545D North Wells St., Chicago, Ill.

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CROSLEY RADIO APPARATUS

Better --- Cost Less

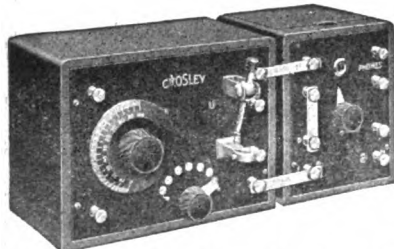


CROSLEY CRYSTAL RECEIVER NO. 1

Beginners in Radio will find this a very efficient unit. With a range from 200 to 600 meters, this set will receive broadcasting stations up to 25 or 30 miles, depending upon conditions and their power.

Complete with head phones, antenna wire insulators ready to install without any additional equipment.—\$25.00.

Crosley Crystal Receiver No. 1 is made so that the Crosley Audion Detector Unit, Crosley Radio Frequency Tuned Amplifier and Crosley Two-Stage Audio Frequency Amplifier may be added if desired, to increase the range and volume of sound.



Crosley Crystal Receiver No. 1 Attached to Crosley Audion Detector Unit

This combination is equivalent to the Crosley Harko Senior No. V. Since this hook-up changes the principle from Crystal to Audion, the detector stand must be eliminated from the remainder of the circuit.

The accompanying photograph shows how this is accomplished by the simple connection of the binding posts. The upper and lower posts are connected, as are the middle posts on the left side of the detector unit. "A" and "B" batteries and one detector tube are needed in the operation of the outfit.

CROSLEY RADIO FREQUENCY TUNED AMPLIFIER (R. F. T. A.)

This unit can be used in connection with the Crosley Crystal Receiver No. 1 and Crosley Audion Detector Unit, or with the Crosley Harko Senior No. V. It can also be used with practically any other type of Audion detector outfit. The tuning feature means selectivity, elimination of static, and great increase in volume of signals. In combination with the above mentioned units, the Crosley R. F. T. A. adds at least six times the volume and range. Price without tube or battery—\$15.00.



WRITE FOR CATALOGUE

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

Efficient, satisfactory and economical, Crosley Radio Units have become well and favorably known to the trade.

Crosley early units, greatly refined in finish and detail are illustrated here together with their new models which have recently been perfected.

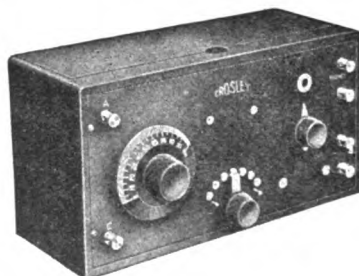
Crosley prices are remarkably low. These prices are made possible by quantity production and up-to-date methods employed in our factories.

Everywhere Crosley "Better—Cost Less" Radio Units are meeting with success.

CROSLEY AUDION DETECTOR UNIT

While this unit may be used with practically any type of tuner, we recommend it especially in combination with the Crosley Crystal Receiver No. 1. It is designed to be operated with almost any kind of hook-up.

Panel finish in Adam brown mahogany cabinet. Without tubes, batteries or phones—\$7.50.



CROSLEY HARKO SENIOR NO. V

This instrument is a combination tuner and Audion detector, recommended for receiving broadcasting stations up to fifty miles. Under favorable conditions ships and stations on the Atlantic Coast are easily copied in Cincinnati. Minnesota hears Newark, Denver hears Schenectady, and other distant points are brought in, except under adverse conditions. Formica Panel, Adam brown mahogany finished cabinet, price as shown without tubes, batteries or phones—\$20.00.

Crosley Harko Senior No. V is equivalent to Crosley Crystal Receiver No. 1 and Crosley Audion Detector Unit.

CROSLEY MANUFACTURING CO.
DEPT. Q.S.T.1 CINCINNATI, OHIO

RADIO APPARATUS

CROSLEY

*Various combinations can be built up
without discarding any apparatus.*

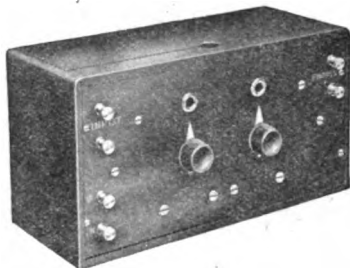
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CROSLEY CRYSTAL RECEIVER NO. I, AUDION DETECTOR AND R. F. T. A.



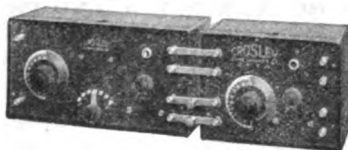
This combination is equivalent to the Crosley Receiver No. VI, shown below. The elimination of the detector stand is accomplished in the same manner as described in

the combination of the Crosley Crystal Receiver No. I and Audion Detector Unit. It has been found that as a result of the hook-up, interference has been reduced to a minimum. Easy to tune, this combination greatly increases the range and volume. Distant broadcasting stations can be heard in loud and clear. One amplifier and one detector tube are required.



CROSLEY HARKO SENIOR NO. V AND R. F. T. A.

Another combination that gives the equivalent of Crosley's model No. V is accomplished by the hook-up of Crosley Harko Senior No. V. and R. F. T. A. This hook-up is made simply by connection of the binding posts directly across. An amplifier tube is used in the

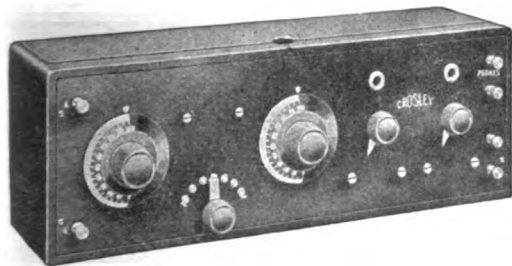


Harko Senior Unit with the grid leak and condenser bridged or short circuited. The detector tube is then placed in the radio frequency tuner. Thus this new unit contains the radio frequency tuner and the detector tube and its control. The combination of Harko Senior and Radio Frequency Unit are superior to any two-tube set that we know of. This unit also has the advantages of sharper tuning, eliminating interference and it reduces static to a minimum.

CROSLEY TWO-STAGE AUDIO FREQUENCY AMPLIFIER

With this unit, two stages of audio frequency amplification can be added to any type of radio apparatus. Can be used in conjunction with the Crosley Crystal Receiver No. 1 and Crosley Audion Detector Unit, Crosley Harko Senior No. V, Crosley R. F. T. A., or Crosley Receiver No. VI. This unit increases the volume about one hundred times.

Designed to match up uniformly with the above mentioned units, without tubes, batteries or phones—\$25.00.



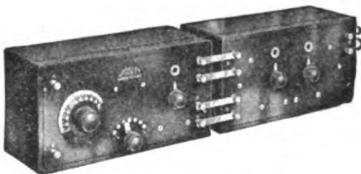
CROSLEY RECEIVER NO. VI

This Unit has approximately six times the range and volume of the Harko Senior. With it, distant broadcasting stations are brought in loud and clear-tuned sharply. It also eliminates static to a large extent.

The Crosley Receiver No. VI consists of tuner, one stage tuned radio frequency amplification and audion detector.

Mounted on formica panel, Adam brown mahogany finished cabinet, without tubes, batteries or phones—\$30.00.

Crosley Receiver No. VI is equivalent to the Crosley Crystal Receiver, Crosley Audion Detector Unit and Crosley R. F. T. A. or Crosley Harko Senior No. V and R. F. T. A.



CROSLEY HARKO SENIOR NO. V AND TWO-STEP AMPLIFIER

The working qualities of each of this combination have been described separately. This combination is not only equal in efficiency but the total cost of the separate unit is lower than that of any other three-tube outfit.

The controls are simple and are very limited in number, requiring very little skill in accurate adjustment.

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CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 CINCINNATI, OHIO

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CROSLEY RADIO APPARATUS

Better --- Cost Less

Various combinations can be built up without discarding any apparatus.

CROSLEY CRYSTAL RECEIVER NO. I, AUDION DETECTOR, R. F. T. A. AND TWO-STEP AMPLIFIER

These various units hooked-up provide the same receiving instrument as the Crosley Receiver No. X shown on the opposite page. This four-tube set consisting of one stage of radio frequency, detector and two stages of audio frequency, gives a combination that meets all the requirements of operators who desire the best on the market. The combined cost of the various units is far below that quoted by other manufacturers.



The combined units are easy to tune and as a result of the design of the various parts, together with that of the units themselves, static and other interference is reduced to a minimum. Better—Cost Less.

CROSLEY HARKO SENIOR NO. V, R. F. T. A. AND TWO-STEP AMPLIFIER



A combination of the Crosley Receiver No. V, the Crosley Radio Frequency Tuned Amplifier and the Crosley two-stage Audio Frequency Amplifier, is another hook-up which is equivalent to the Crosley Receiver No. X. This four-tube set, consisting of one stage of radio frequency, detector and two stages audio frequency, brings in clearly and distinctly, signals broadcasted within a radius of hundreds of miles from stations using a reasonable amount of power. The most inexperienced operators are able to obtain the best of results in using this combination because of its simplicity of tuning. Radio Engi-

neers have expressed enthusiasm in the results obtained from this combination after it had been tested by them working under all conditions.

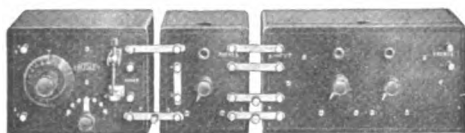
CROSLEY RECEIVER NO. VI, AND TWO-STEP AMPLIFIER

Still another hook-up equivalent to the Crosley Receiver No. X, is a combination of the Crosley Receiver No. VI and the Crosley Two-Step Amplifier.

The efficiency of this combination, one step of radio frequency, detector and two stages of audio frequency has been mentioned above. It might be added, however, that with it ship and shore stations on the Atlantic Coast are easily copied in Cincinnati, while radio telephone concerts and voice from Pittsburgh, Detroit, Chicago, Newark, N. J. and many other broadcasting stations are easily picked up. Even though the price of this set is lower than any other four-tube outfit, there is no better set on the market.



CROSLEY CRYSTAL RECEIVER NO. I, AUDION DETECTOR AND TWO-STEP AMPLIFIER



The Combination of the Crosley Crystal Receiver No. I, Crosley Audion Detector and the Crosley Two-Step Amplifier is the same as the Harko Senior and Two-Step hooked together. This combination is exceptionally efficient in the reception of signals broadcasted on the average wave length. Owners are well pleased with their ability to tune in on far away stations with the use of this outfit.

WRITE FOR CATALOGUE

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.
DEPT. Q.S.T.1 CINCINNATI, OHIO

RADIO APPARATUS

CROSLEY

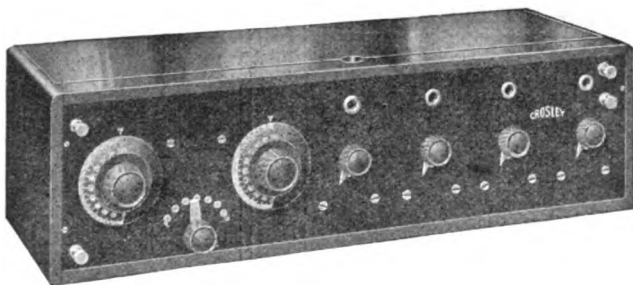
Better --- Cost Less

CROSLEY RECEIVER NO. X

In placing this receiver upon the market, we are offering you a unit whose range, volume and selectivity are remarkable. Nothing can be compared with it at double the price. Developed in the Crosley laboratories, this unit combines tuner, one stage of tuned radio frequency amplification, audion detector and two stages of audio frequency amplification.

As shown, without tubes, batteries or phones, solid mahogany cabinet—\$55.00.

Crosley Receiver No. X is equivalent to Crosley Receiver No. XI and Crosley Two-Stage Audion Frequency Amplifier.



CROSLEY RECEIVER NO. XV

This receiving set is the same as Crosley Receiver No. X, with the addition of a special sound resonating chamber for use as a loud speaker in connection with a pair of head phones. The addition of this sound resonating chamber is a feature that appeals to many persons. With it, every person in a room is usually permitted to hear the music or signals that are being received. Often it will be found that the en-

tire house is filled with music broadcasted by some far away station.

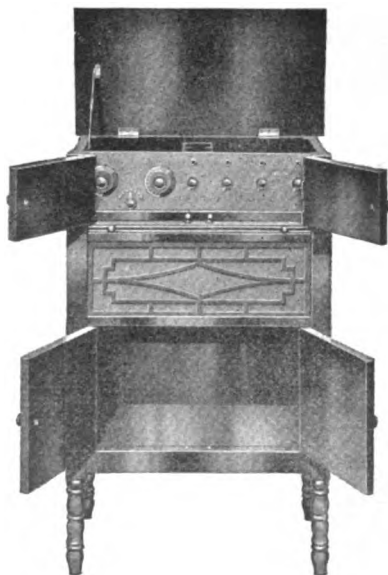
Mahogany finished cabinet without tubes, batteries or phones—\$70.

CROSLEY RECEIVER NO. XX

Crosley Receiver No. XX is the Crosley Receiver No. XV in an upright cabinet. A hinged lid when raised, allows the operator access to every part of the receiving apparatus. The doors, both upper and lower, are also hinged. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Wires lead from the binding posts on the receiving set to the batteries in the lower compartment.

Music received on this instrument will be heard throughout a large room and often throughout an entire house—the latter feature depending upon the power of the broadcasting station.

Mahogany finished. Without tubes, Batteries or Phones—\$100.00.



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CROSLEY MANUFACTURING CO.

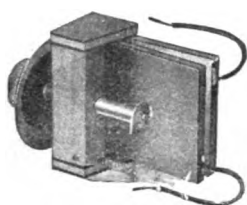
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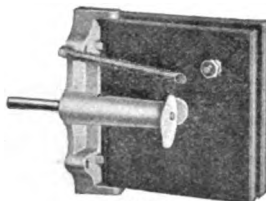
117

CROSLEY RADIO APPARATUS

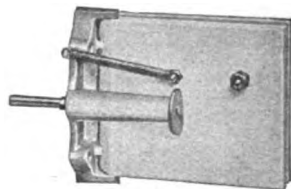
Better --- Cost Less



MODEL A



MODEL B

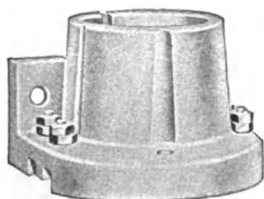


MODEL C

CROSLEY VARIABLE CONDENSERS

The Crosley Variable Condenser is unquestionably one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

Model A, .0005 Mfd. (Wood Frame)..... \$1.25
 Model B, as illustrated, .0005 Mfd..... \$1.75
 Model C, .001 Mfd. (Porcelain Plates)..... \$2.25

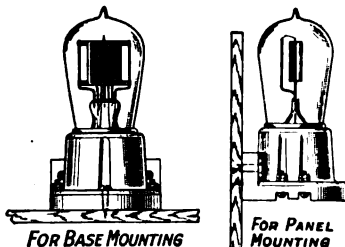


CROSLEY V-T SOCKET

This socket has been pronounced by many radio engineers the best socket on the market. Ever since its announcement, its success has been phenomenal.

Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency service and practical unbreakability. Patents Pending. Beware of Imitators.

Made of porcelain for base, or panel mounting—\$0.50.



FOR BASE MOUNTING

FOR PANEL MOUNTING

Patent Applied For

CROSLEY RHEOSTAT

This rheostat permits exceptionally accurate and delicate variations of the filament current. With it the best possible results are received from expensive vacuum tubes.

Unique construction allows the Crosley Rheostat to be mounted on a panel of any thickness up to and including $\frac{3}{4}$ inch. The resistance is made of non-corrosive wire.

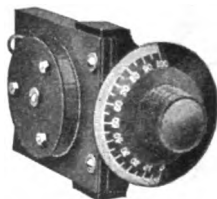
Furnished complete with newly designed tapering knob, pointer, etc.—\$0.60.



CROSLEY R. F. A. T.

The Crosley Radio Frequency Amplifying Tuner is a new unit which takes the place of the Radio Frequency Amplifying Transformer and is much better. It makes possible sharp and efficient tuning over a broad band of wave lengths from 200 to 600 meters.

With Instructions—\$4.00.



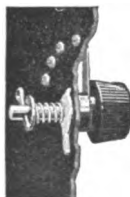
CROSLEY KNOB AND DIAL



Attractive and inexpensive, Crosley knobs and dials are extremely well made for all required purposes. The dials are made of solid hard rubber $2\frac{1}{8}$ in. diameter, with the letters and figures stamped into them and white enameled.

Furnished Standard for $\frac{1}{4}$ " shaft or $\frac{1}{8}$ " shaft, optional—\$0.40.

CROSLEY TAP SWITCH



The unique construction of Crosley Tap Switches assures a constant tension and eliminates all possibility of the switch loosening and developing a faulty contact on the taps. A stationary washer of our own design has a soldering lug which makes possible a bus wire connection.

Price each complete..... 30 cents
 Switch Taps for the above made of brass, nickel-plated and complete with brass nut, $2\frac{1}{2}$ cents each.

WRITE FOR CATALOGUE

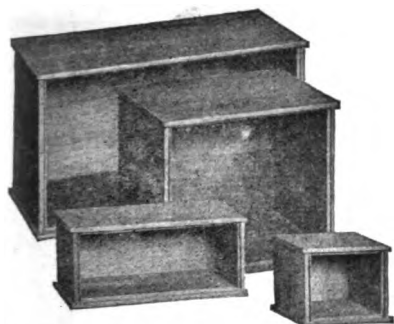
Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.
 DEPT. Q.S.T.1 CINCINNATI, OHIO

RADIO APPARATUS

CROSLEY

Better --- Cost Less



CROSLEY

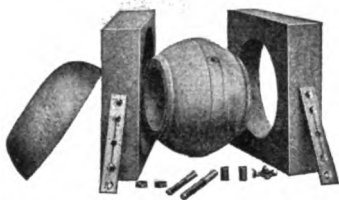
RADIO CABINETS

Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish, and of the best workmanship.

The Crosley Radio Cabinets are made of hard wood, Adam brown mahogany finish.

CROSLEY VARIOMETER PARTS

These Variometer parts are made in our own large wood working plant on special automatic machinery, which enables us to not only offer them to you at a price reduction, but to make each part accurately.

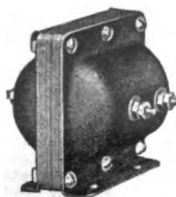


Each Variometer set consists of two stators, one rotor and the necessary hardware, shown in the illustration.

Made of poplar wood, well shellaced.....\$1.50
Made of Mahogany.....1.75
Winding form extra......30

CROSLEY SHELTRAN

Incorporated in the design of the Crosley Sheltran, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The Crosley Sheltran is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.



Better—Costs Less—\$4.00



CROSLEY BINDING POSTS

These are made in three sizes— $\frac{3}{8}$ " diameter, $\frac{1}{2}$ " diameter and $\frac{5}{8}$ " diameter. They are all of the same design, however, as shown in the illustration.

No. 1..... 5c each
No. 2..... 7½c each
No. 3..... 10c each

CROSLEY MAGFON

No Radio station is complete without this Magfon. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the Crosley Magfon by simply inserting it in the back of the cabinet.

Mahogany finish—\$10.00.



CROSLEY VARIO-COUPLER PARTS

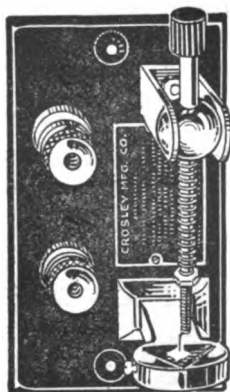
The Crosley Vario-Coupler is made with the same accuracy as the Crosley Variometer, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.



Complete as shown in illustration, ready for assembly—\$1.50. Also furnished completely wound and assembled complete with knob and dial "Better—Costs Less"—\$3.00.

CROSLEY CRYSTAL DETECTOR STAND

This unit is especially well constructed, neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystal, binding posts, etc., manufactured under the following patents: "Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 28, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement.—\$2.50.



WRITE FOR CATALOGUE

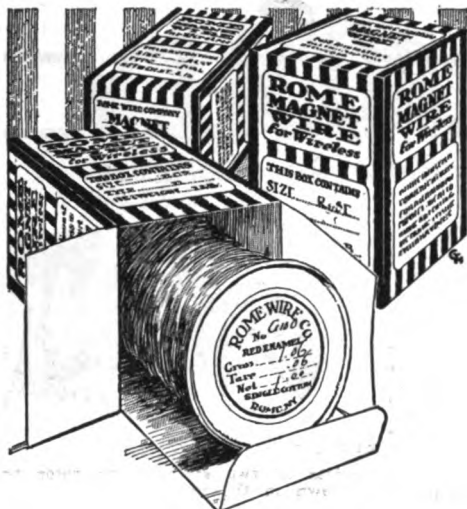
Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 CINCINNATI, OHIO

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

119



For satisfaction
Demand Rome Blue
and White Package
or Label.

ROME RADIO WIRE

Magnet Wire

Best Quality Plain Enamel Covered;
Enamel—and Single or Double Cotton Covered; Single or Double Cotton Covered.

All sizes; 1/4-lb. to 40-lb. packages.

Antenna Wire

Best Quality Solid or Stranded Copper Antenna Wire, plain or tinned; put up in lengths of 100-ft. and 150-ft. or on 24" reels of 200-lbs.

At Your Dealer's

ROME
WIRE COMPANY
ROME, N.Y. BUFFALO, N.Y.

DISTRICT SALES OFFICES.

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*Protect
your VT's*



PATENTS
PENDING

KLOSNER Vernier RHEOSTAT

EVERY TUBE you have deserves a Klosner Vernier Rheostat. The Klosner **WIRE WOUND** feature produces a low starting current preventing sudden strain and thereby prolonging the life of the tube.

The Klosner provides micrometer adjustment for your critical detector tubes. One single knob controls both the rough and vernier adjustments. It is unsurpassed for loud-st reception of telephone and C.W. and is essential for detector tubes of radio frequency amplification. Awarded the New York Evening Mail's Certificate of Excellence. Insist on the genuine—made only by the originators. Look for the name "Klosner" moulded on the base. The cost is no more than for other Rheostats without these exclusive features. At your dealer or send for interesting literature. Klosner Improved Apparatus Co., Dept. Q, 2024 Boston Road, New York City.

Dealers: This is the fastest moving rheostat on the market. It is stocked by all leading jobbers. Get your supply from them.

**One Single Knob
No Sudden Strain
\$1.50**



Cunningham tubes

The Heart of
Your Home Receiving Set

AMPLIFIES AS IT DETECTS

*—enjoy clear reception by
using Cunningham Tubes*



TYPE C-300
GAS CONTENT
DETECTOR

\$500

TYPE C-301
HIGH VACUUM
AMPLIFIER

\$650

PATENT NOTICE
Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

248 First Street
San Francisco, Calif.

Cunningham Detector Tube known as type C-300 insures clearest reception for all radio messages, concerts, press and weather reports.

The rigid specifications to which these tubes are built in the General Electric Laboratories determine their uniform operation and perfect clearness.

Cunningham Amplifying Tube known as Type C-301 is conceded to be the most efficient amplifier ever produced. For complex and multi-stage circuits, freedom from distortion and absence of all tube noises as well as for the operation of loud speaking telephones and devices requiring considerable power, this tube has no equal.

If your dealer cannot supply you write us direct for the name of a Radio Dealer who can.

E. J. Cunningham

Trading as
AUDIOTRON MFG. COMPANY



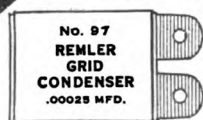
The trade mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

154 West Lake Street
Chicago, Illinois

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

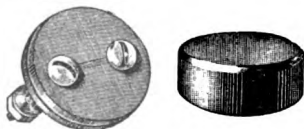
REMLER *Cunningham*

APPARATUS THAT RADIATES QUALITY



No. 97 Fixed Grid Condenser Price, 20c

No. 96 Variable Grid Leak
Price, 40c



Type No. 100
3-inch Bakelite Dial with Knob and Bushing 75c

Remler Parts for Your Set

On this page are shown the popular line of Remler switches, the Remler Fixed Grid Condenser, the Remler Variable Grid Leak and the famous Remler Dial.

This represents but a small fraction of the Quality Radio Apparatus that has put Remler in the leading position it holds today. This small fraction, however, is built with the same care, accuracy and precision that has made the entire Remler line universally known as Quality Radio Apparatus.

It is becoming more and more apparent that Remler Apparatus is preferred in the building of sets because of its uniformity of construction—the well balanced proportion of each item giving an accurate and a pleasing appearance to the finished set.

Insist on Remler parts. If your dealer cannot supply you, write us direct for the name of a Radio dealer who can.

REMLER RADIO MFG. CO.

E.T. CUNNINGHAM GENERAL MGR.

248 FIRST ST. SAN FRANCISCO, CAL. 154 W. LAKE ST. CHICAGO, ILL.

REMLER

Giblin - Remler INDUCTANCE COILS

**APPARATUS
- THAT -
RADIATES
QUALITY**

Type and Number of Turns, Mounted	Price, Mounted	Type and Number of Turns, Unmounted	Price, Unmounted	Inductance in Milli-henrys at 1000 cycles. Accuracy 1/2 %	Natural Wave Length in Meters. Accuracy 1/2 %	Distributed Capacity in micro-microfarads. Accuracy 1 %	Wave Length Range in Meters of .001 max. and .00004 mid. min.	High Frequency Resistance in Ohms at 1/2 Wave Length Shown
RG 20M 1.50 RC 20U .70				.030	39 14.3	63	334	1.1
RG 25M 1.50 RC 25U .70				.041	47 15.2	75	389	1.5
RG 35M 1.50 RC 35U .70				.083	87 25.4	128	550	3.5
RG 50M 1.50 RC 50U .80				.169	114 21.6	185	785	8.8
RG 75M 1.85 RC 75U .85				.377	163 19.5	266	1170	28.3
RG 100M 1.70 RC 100U .90				.666	217 19.9	356	1550	80.3
RG 150M 1.75 RC 150U .95				1.503	281 14.8	512	2320	1000
RG 200M 1.80 RC 200U 1.00				2.68	374 14.7	690	3110	2000
RG 250M 1.90 RC 250U 1.10				4.20	424 12.1	860	3880	5000
RG 300M 2.00 RC 300U 1.20				6.11	494 11.2	1030	4680	10000
RG 400M 2.10 RC 400U 1.30				11.04	618 9.7	1380	6300	
RG 500M 2.30 RC 500U 1.50				17.50	747 9.0	1730	7900	
RG 600M 2.40 RC 600U 1.60				29.2	1024 10.1	2260	10250	
RG 750M 2.65 RC 750U 1.85				39.0	1249 11.3	2680	11850	
RG1000M 3.40 RG1000U 2.50				71.6	1620 10.3	3570	16000	
RG1250M 3.80 RG1250U 2.90				108.0	1930 9.7	4380	19700	
RG1500M 4.40 RG1500U 3.50				159.8	2300 9.3	5300	23800	

This table compiled by Robert F Field of Craft High Tension Electrical Laboratory, Harvard University, Cambridge, Mass.

The Ideal Loading Coil

These new inductance coils will increase the wavelength range of your short wave receiving set.

There is nothing more fascinating than the reception of radio messages from high-power stations located thousands of miles away. These stations use wave lengths between 1000 and 25,000 meters. This is far above the receiving range of

the average receiver designed for amateur broadcast reception.

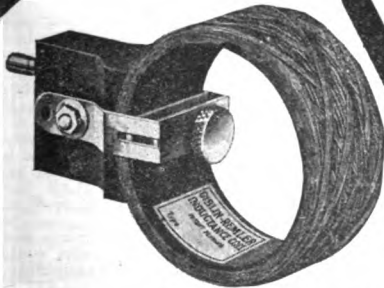
Inserting Giblin-Remler Coils of the proper values (determined from the table shown on this page) and shunted by a variable condenser, in series with the antenna circuit and the secondary circuit of your receiver, will increase its wavelength range any desired amount.

The Giblin-Remler Coil makes possible the reception of high-power, long wave foreign stations, as well as time signals, press and weather reports from various naval stations throught the United States.

REMLER RADIO MFG. CO.

E. T. CUNNINGHAM
General Manager

248 First St., San Francisco, Cal.
154 W. Lake St., Chicago, Ill.



Maximum Inductance and Minimum Distributed Capacity

CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 10th of month for succeeding month's issue.

WEST COAST signals all over the room with 4GL radio frequency transformers. Range 200-600. Price \$3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

BARGAIN—Regenerative receiver with two stage tube equipment \$48—Carl Anderson, 1126 Gibbs Ave., St. Paul, Minnesota.

JR. SCIENTISTS: Our magnet wire stock is complete. Depend on "ARCO" to supply your needs. Low prices. Quick Service. Send 6c for Bulletins Listing Hundreds of good products. American Radio Co., Box 133, Baltimore, Md.

LOUD SPEAKER UNIT:—For horn or phonograph attachment. Clarion type 3-C. Five dollars. Few Brandes TransAtlantic Head Sets from bankrupt stock. List twelve dollars. Our price Six-fifty per set. Enclose money order and address: Citizen Wireless Service, Hornell, New York.

FOR SALE—One station type Voca-Loud in good condition. \$24. August Bauer, Chesaning, Mich.

BESTO' ALL RADIO FREQUENCY TRANSFORMERS: two hundred to six hundred meters; mounted for use in standard socket also has binding posts. Two Dollars each; unmounted for cabinet sets One Dollar each, postpaid in U. S. Guaranteed on money-back basis. Sold direct, eliminating middleman's profit. **BESTO' ALL RADIO SHOP**, Ballston, Va.

SELL—Thordarson 1/4 kilowatt transformer, new, \$18 Thad Bryan, Ocean Springs, Miss.

RUBBER STAMP with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred Post cards 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

SELL: Amrad Basketball Variometer, \$5.00; Western Electric fones, \$10.00; Thordarson Amplifying Transformers, \$3.50 Anti-capacity switches, \$1.50; Following at 25% off list: DL-50, L-100, DL-100, L-250, L-400, L-500, L-750, DL-1250, L-1500; Murdock OT \$3.00; Mesco 1" spark coil, \$3.50; Kilbourne Clark Quenched Gap, \$4.00. Write, Howard Chinn, 210 West 102 Street, New York City.

FOR SALE COMPLETE only one kilowatt spark transmitter, Marconi forty thousand volt secondary "Coffin." Thordarson OT, Special OT, Robbins and Meyers thirty four thousand revolution gap, Boston key, Marconi loading inductance, one hundred forty cash fob Cuero R. A. Fulk, Cuero, Texas.

BARGAINS—Regenerative, \$36; 15 dial Omnigraph, \$24; Navy Coupler, \$12; Small Spark Set, \$20. All in excellent condition. Robert Fairchild, Portville, N. Y.

SELL—Practically new Emerson 220 volt motor. Makes excellent 600 volt generator. \$23—E. C. Espy, Vandergrift, Pa.

PRINTED CARDS—Description of your station with QRA. 500 \$4.00; 1000, \$6.00, delivered. Samples on request. Donald Detwiler, 3BSB, 1120 Virginia Ave., Washington, D. C.

FOR SALE: Z-nith regenerator & Amplifigon AGN-31 Benwood 15 watt C.W. and fone set. All apparatus latest type and used but a short time. Address Herbert L. Gordon-Radio 8-BAS, Antwerp, Ohio.

BARGAIN: 3 three circuit regeneratives with Detector and two step in same cabinet, \$80 absolutely new. 1/4 KW spark with enclosed gap and Thor. trans., \$35. Myron Gould, 12542 Clifton Boulevard, Lakewood, Ohio, Ex 8GE.

BARGAINS: As Long As They Last. DeForest DT-800 two-stage Amplifiers, \$22.75 each; Cabinet Type Vacuum Tube Detectors with Condenser and Variocoupler Tuning, \$20 each; approved 100-ampere 600-volt 5-inch break Ground Switches, \$2.25 each. Sent

postpaid on receipt of price, or parcel post collect on receipt of order. Ludwig Hommel & Company, 530 Fernando St., Pittsburgh, Pa.

SELL: Ten watt C.W. set, tubes and transformer, complete \$45. Arthur Houlihan, Woodlawn Ave., Ansonia, Conn.

A REAL radio frequency transformer for amateur use; beats anything on the market; range 200-800 meters; designed by 4GL; price \$3.15 each postpaid anywhere in U.S. Circuit with each transformer. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

FOR SALE: Navy Type Coupler 3500 meter, \$15 excellent condition. 2 Old double filament Audiotrons never used equipped with standard adapter \$10 each. Radio Corporation Amplifier Transformer \$5. Two back of panel rheostats \$1 each. Geo. B. Kaiser, Wharton, Texas.

SELL: Regenerative Receiver 150-600 meters bakelite panel; oak case, cost \$45, make me an offer. Clarence Kelley, Saco, Maine.

FOR SALE: 8SP SPARK: 1KW Acme Transformer, 220 Volt \$23.00. Aluminum type Benwood gap, complete with 110 volt motor, new glass bushings, oilless bearing and coupling \$28.00. Both as good as new. A. G. Kinsner, Fairmont, W. Va.

FOR SALE: Practically new Clapp-Eastham H.R. receiver \$28. Wanted, Paragon RA10, write Raymond Mathison, Gladstone, Michigan.

EDISON B BATTERY ELEMENTS. Make your own. Can be recharged and lasts for years. 200 ampere hour A batteries, guaranteed \$35.00. Harry Morrell, 52 Goffe St., New Haven, Conn.

ODDS AND ENDS—Storage Battery, Eveready 6v. 110 amp. new \$15, cost \$20; 1 UV 200 \$4; 2 UV 201 \$6; 1 Electron Relay tube \$4; Pair 3000 ohms \$12. Dictograph headset \$9; Faradon UC 1820 variable condenser \$5; Boston Key \$5; Homcharger, good condition \$12; alcohol blow torch and iron \$1; Hydrometer \$1. Forty lessons of electrical course sacrifice \$10. Navy radio air craft course \$3. All answered 3BTD, c/o Wm. Wallis, Jr., 3118 Fourteenth St., N. W., Washington, D. C.

9JD 20 WATT CW and Fone set for sale: Mounted on 1/4 inch hard rubber panel, in oak cabinet. Radiation 1-2 amps. 350v.-750v. A.C. R.A.C. or M.G. 50-150 MA. VT'2. DX: Miami, Fla. & Pittsburgh on fone. Calif., Conn., Vt. & La. on CW. Complete for \$150. First M.O. or draft takes it. 9DVL, P.O. Box 77, Naperville, Ill.

FOR SALE: Regenerative Single Circuit Receiver with V.T. 1 tube \$25. Also Crystal Set with 3,000 ohm phones \$15. Excellent condition all instruments guaranteed. A. Nowell, Dublin, N. H.

FOR SALE: One regenerative receiver, (2 variometers, variocoupler, variable condenser) and detector, 2 step amp. to match—cost \$140 used 2 months. First check \$95 takes it. 2 Tuska variometers—used, \$5.00. Donald H. C. O'Neil, 5602 Etzel Ave., St. Louis, Mo.

TESTED GALENA CRYSTALS From our own Mines shaped, and tested at the mine in best standard hookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for \$1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

MAKE YOUR OWN Head Phones. Complete parts including Headband, Cases, Magnets, coils completely wound 2000 ohms, all ready for assembling with instructions \$3.50. South Hills Radio Co., 411 Charles Street, Knoxville, Pittsburgh, Pa.

NEW WESTINGHOUSE RC for Grebe CR 9 or Sell. 8 South Ohio, Atlantic City, N. J.

AMRAD TUNER and detector two step, ninety dollars. Clapp-Eastham H.R. receiver with H.Z. amplifier, mahogany, sixty-five dollars. Magnavox R3, forty dollars. All new, perfect condition. Send money-order. Ridgewood Orchard, Winchester, Virginia.



JENKINS VERNIER RHEOSTAT
Indispensable for adjustment on Radio Frequency and Detector Tubes. Patent instant cut-off switch. Write for folder.
Liberal discounts to dealers and jobbers.
Manufactured & Guaranteed by
UNITY MANUFACTURING CO.
224 No. Halsted St., Chicago, Ill.
Phone Haymarket 1819

\$1.75

The Standard Idea

Assembled But Not Wired

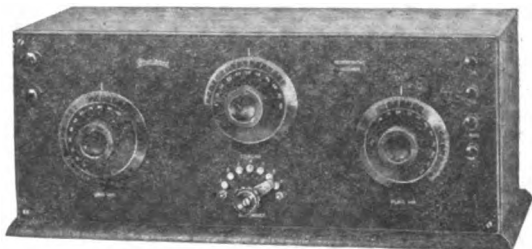
THE STANDARD IDEA permits you to purchase radio equipment in a new way—a **cheaper way**. We manufacture a full line of instruments—including a Detector and Two-Stage Amplifier and a Multiple Wave Tuner—that embody the latest and most successful developments in radio. These instruments are shipped to you—**complete assembled—but not wired**. You do the wiring yourself with the diagrams and instructions furnished with each machine or using your own ideas if you prefer.

The STANDARD IDEA enables you to effect a saving of **20% or more** when you buy your instrument, for the wiring, being hand-work exclusively, is the most expensive operation in radio manufacture. By eliminating this costly item you save money and have the fun of doing all your own wiring.

Write today for literature descriptive of the STANDARD IDEA and prices and descriptions of the various machines we make. You will be interested in our offer to ship any machine for inspection on receipt of 1/3 the purchase price which is cheerfully refunded if you are not satisfied.

**STANDARD ASSEMBLING
COMPANY**

6 Stone St. New York, N. Y.



SPECIALTY SERVICE COMPANY

Distributors for
LAWSAM RADIO PRODUCTS

We have a complete line of C.W. transmitting apparatus for the coming season.

Write for prices
RADIO 2RM

Cor. 4th Ave., & Pacific St., Brooklyn, N. Y.

BUILD YOUR OWN

Complete 50c instruction book for 20c only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we **20c** send free our price list of parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c only. Money back if not satisfied.

RADIO PARTS MNFG. CO.
Dept. 13, Park Place W., Detroit, Mich.

WHILE THEY LAST: Fada Rheostats, \$0.85; 43 plate variable condensers, panel mounting, \$3.30; 23 plate, \$2.70; DeForest Everyman Sets, \$21; Brach Lightning Arresters, \$1.85; 100 ampere lightning switches \$2.50; Murdock 3000 phones, \$5.30; Fixed condensers, \$0.60. Radio Electric Service Station, 151 Main St., Tottenville, S. I., N. Y.

EDGEWISE COPPER .033x.295x3 1/4" Diameter 50 turns \$3.50 postpaid. Radio Specialties Co., Counellsville, Pa.

SPECIAL THIS MONTH: Westinghouse R. C. Receivers, R.A. Tuners, D.A. Detector-Amplifiers. 10% off list prices. Prompt shipments or money refunded. Wesley Robinson, Jr., St. Marys, Georgia.

FIRST \$100 takes complete Regenerative Set. Honeycombs. New. Fred H. Reichert, Hawley, Pennsylvania.

FOR SALE: Meteor .01 Condenser, Thor OT, Franklin Gap, Thor Type R Transformer, Marble base change-over switch. All good. Make offer. Allen Strete, West Mansfield, Ohio.

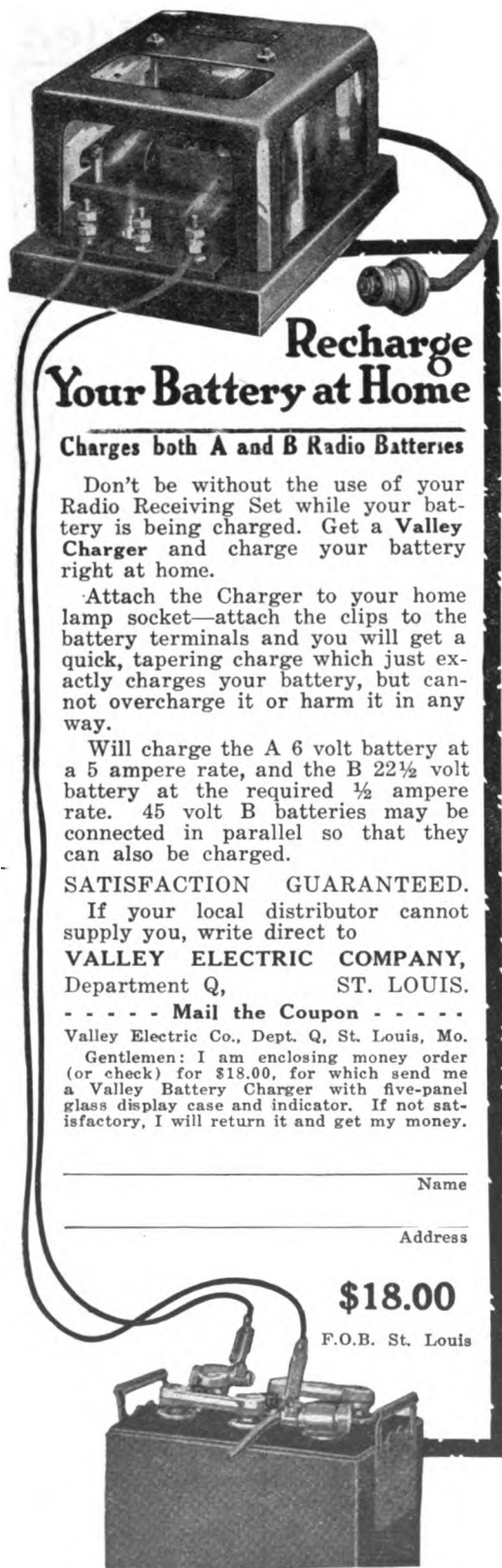
LIBERTY C.W. TRANSMITTING and Receiving products. We manufacture "Liberty" C.W. power and Filament transformers. Choke Coils. "Liberty" Catalog ready September 15. Amateurs, use "Liberty" equipment for your relays. **DEALERS** write. Snyder Radio Manufacturing Company, Ashland, Ohio.

INVENTORS: Protect your invention through A. M. Wilson, Inc., Washington, D. C. Over 20 years of efficient, expert, confidential service. Skilled in Radio-Electrical, Chemical, and Mechanical fields. Our 1922 Illustrated Booklet, giving much necessary and very useful information which every inventor should know, will be sent free upon request. Prompt and careful attention. Highest references. Moderate fees. Send sketch or model for our careful opinion and preliminary advice. Write today to A. M. Wilson, Inc., 310-16 Victor Building, Washington, D. C. (Successor to business established in 1891 by A. M. Wilson.)

GREBE CR3 \$45.00. Grebe Detector and two step amplifier \$40.00. Both fine condition, Wesley Robinson, Jr., St. Marys, Georgia.

4GL RADIO frequency transformers; DX, fones and 600 meters; \$3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

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Radio Frequency Amplifying Transformers

What is Radio Frequency Amplification?

Radio Frequency Amplification is the increasing of the strength of radio signals or waves before they are applied to the detector tube, where they are made audible.

What results will I get by adding Radio Frequency Amplification to my set?

Louder signals with less noise in your set; distant stations which your detector alone cannot pick up. Less interference and less static disturbance, particularly if you use a loop indoor aerial.

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What must I add to my set to use Radio Frequency Amplification?

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What Radio Frequency Transformer is built that way?

The transformer manufactured by the Radio Service Laboratories, Inc., is built on this engineering principle. The comminuted iron closed core (a special form of divided magnetic material) completely encloses the bobbin or transformer windings thus broadening the wave-length range, increasing the amplification per stage, shielding from stray magnetic fields, and eliminating capacity and leakage effects.

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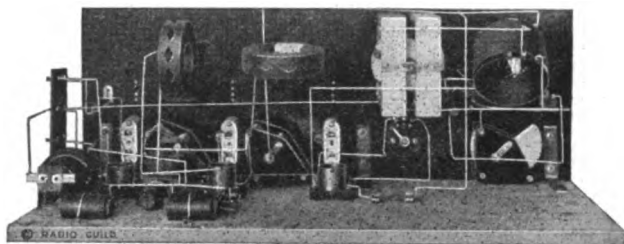
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Receive Broadcasts on a Loop with this Super-Regenerative Receiver



Enormous amplification obtained with this three-tube set designed and recommended by Kenneth Harkness.

Three-tube Super-Regenerative receiver completely assembled and ready for wiring—mounted in an attractive mahogany cabinet.....

\$95.00

All the parts for this super-regenerative including drilled and finished bakelite panel, special filter unit and choke coils of correct values—especially designed and manufactured by us, complete.....

\$75.00

See Article
Page 27

Full directions, descriptions and Harkness booklet free with each set.

The New ARMSTRONG Super-Regenerative Receiver

How to construct and operate. By Kenneth Harkness
The only authentic booklet with 12 diagrams and photos of sets actually constructed by the author.

Literary Digest says: "Mr. Harkness' circuit using three tubes relatively easy to operate."

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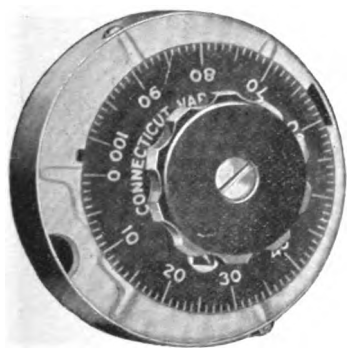
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Ask some amateur who is using a
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If you measure the value of an instrument by what it does rather than by what it costs, you'll use the CONNECTICUT Variable Condenser. We have an interesting booklet describing the theory and performance of the instrument in full. We'll gladly send it on request.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

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GET THE FACTS

The Amrad Catalog gives you the latest information about the newest, TEST-ED developments in Radio

Its loose-leaf make-up assures up-to-the-minute facts while they ARE facts.

It will be sent FREE to QST readers until October 15th.

We want this Catalog in the hands of every reader of QST because we believe it contains vital information useful to the more advanced radio man. Besides containing descriptions of the entire Amrad line, there are Bulletins on Radio Frequency including the new Amrad Radiformers (R. F. Amplifying Transformers); the S-Tube Rectifier—the tube without a filament; Mershon Electrolytic Condensers; Amrad Basketball Variometers and Couplers; and important receiving specialties for the man who builds his own.

The Amrad Catalog is regularly distributed upon receipt of ten cents to defray partially its cost. Write for your FREE copy NOW—while you have it in mind.



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Oct '22

ENGINEERING

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Results or
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In 1915 the *first* regenerative receiver, Paragon, was manufactured.

In 1916 Paragon effected the *first* transcontinental reception (not prearranged) from New York to California.

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Paragon needs no extravagant claims; but we guarantee our customers this:—that Paragon Products are reasonable in price, sound in design and thorough in workmanship.

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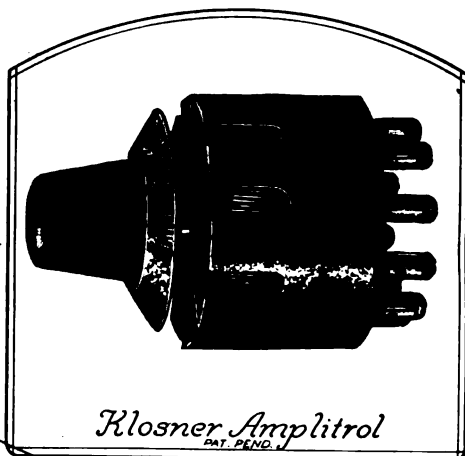
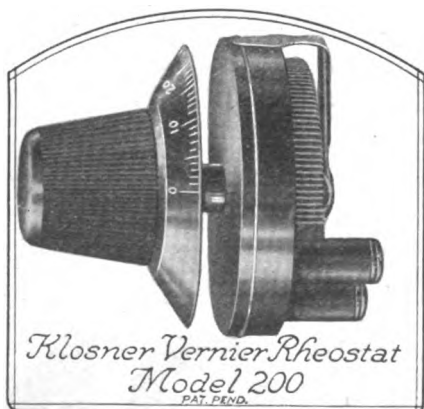
RADIO PRODUCTS



The ideal combination for VT control without the use of jacks or plugs.

We are the inventors and sole manufacturers of the famous Klosner Vernier Rheostat Model 100 still being sold for \$1.50.

Write for interesting literature on the "Amplitrol" and the Klosner Rheostats. Ask for Booklet OE.



THE long looked for has at last arrived. The new Klosner "Amplitrol" fills that long felt radio want—that of controlling the vacuum tube circuit without the use of jacks, plugs or any additional switches. A real radio necessity. Each of your amplifier tubes deserves one. No more plugging in from one stage to the next. Simply attach your phones or loud speaker to binding posts and turn on any stage at will.

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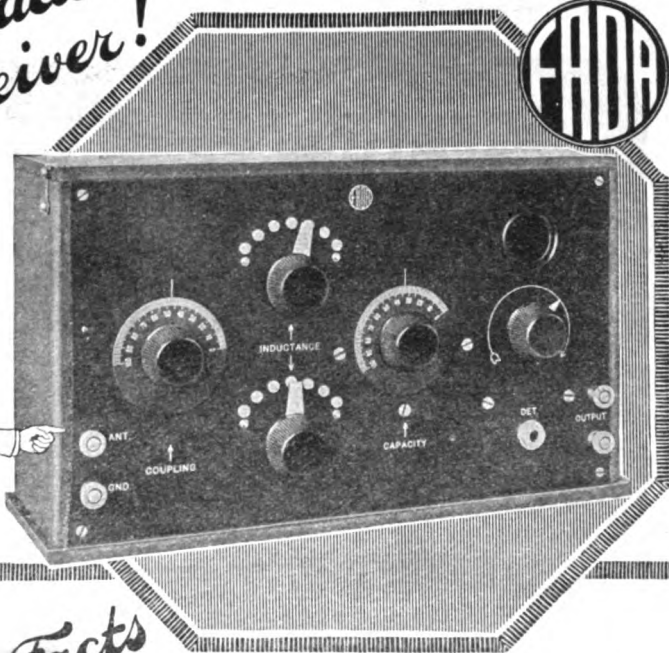
Made of moulded condensite. Contacts of phosphor bronze. Exposed metal parts highly nickel plated. New style tapered knob, and dial correctly numbered in white lettering. Price \$4.00.

What the "Amplitrol" is to the amplifying tube, so the Klosner Rheostat is to the detector tube. The new improved Rheostat Model 200, embodies some vast changes and improvements. These are too numerous to list, but your inspection will immediately win your approval. The "Amplitrol" and the new improved Klosner Rheostat are the ideal combination for your vacuum tubes. Klosner Rheostat Model 200, Price \$1.80.

The "Amplitrol" and the Rheostat do not employ the graphite disc principle, but that of wire wound. This feature insures perfect contact at all times, making tuning quicker and louder and giving greater range. See them at your dealers or write for literature.

Klosner Improved Apparatus Co.,
2024 Boston Road
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Here's the Fada Receiver!



*and
There's the Facts
about it.*

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OF
FADA - FACTS**



The new Fada handbook will be sent to you upon receipt of 5c to cover postage. It's a How-To-Do-It book and you should have it

An Ideal Home Entertainer

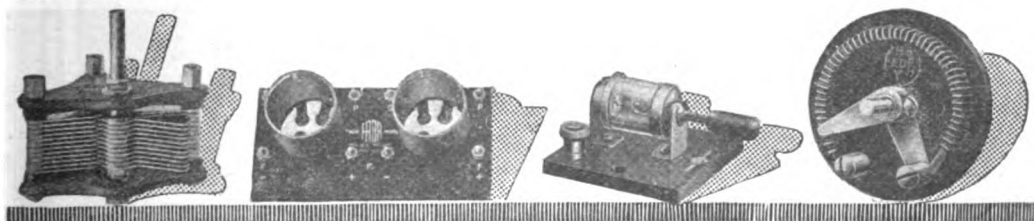
The Fada receiver, a result of the same perfection in design and construction that distinguishes all Fada products, is gaining popularity as an ideal home entertainer.

When it's radio time in your home, you can sit back in your favorite chair, among the family circle, and command at your fingers' touch the talent of such noted artists as May Peterson, Percy Grainger, or Mme. Margaret Namara.

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With a Fada radio receiver, music can be made part of your daily recreation. And after the musical program there is broadcasted a digest of important world events. A Fada receiver keeps you a jump ahead of tomorrow's newspapers.

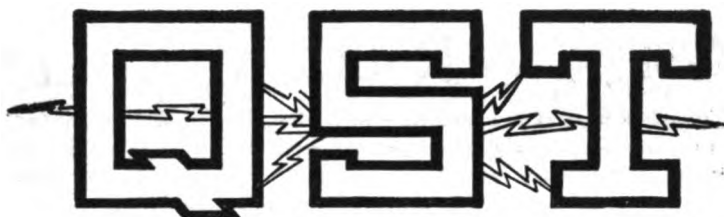
Frank A. D. Andrea
1581-E Jerome Ave. New York City



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"TREASURES OF GOLD AND JADE"
 SAID LAO TZU, "DESERVE A
 PROPER DWELLING!"
 "GREBE RADIO IS NOW HOUSED IN A
 MANNER BEFITTING ITS EXCELLENCE."
Doctor Wily



The Official Organ of the A.R.R.L.

VOLUME VI

OCTOBER, 1922

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HARTFORD, CONN.

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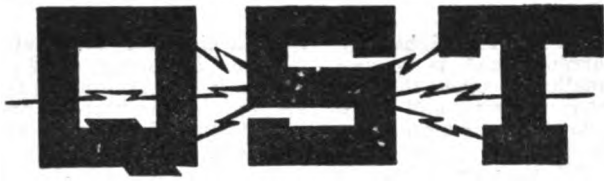
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A Magazine Devoted Exclusively to the Radio Amateur

Electric Wave-Filters

Electric wave-filters are one of the means which have made possible some of the recent advances in communication engineering. They were invented by Dr. G. A. Campbell of the American Telephone and Telegraph Company and have been widely used in the communication systems developed by the research engineers and scientists of this company and the Western Electric Company. A demonstration of their use was recently given by Dr. Frank B. Jewett, Vice President of the Western Electric Company, before the New York Telephone Society. In response to our request, Dr. Jewett has supplied our readers with the following discussion of filters.—Editor.

THE electric wave-filter is to-day a very important part of our communications systems. We use it in ordinary wire telephony, in carrier-current systems, in multiplex telegraphy or telephony, and in radio telephone and telegraph systems.

A filter is an electric circuit, or artificial transmission line, built up of coils and condensers and so designed as to transmit all the frequencies (wave lengths) within a certain range, but to fail completely to transmit those without this range. By its use, therefore, we may select signals of any desired wave length from other signals which are very close in wave length. It offers, therefore, a more refined method of selecting than the ordinary tuned circuit with which the radio amateur is familiar.

The principles which underlie the operation of filters are simple and easily understood. The actual design, however, of a

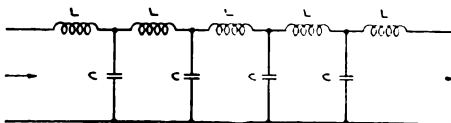


FIG 1

filter to transmit a specified range of frequencies (i.e. all wave lengths within a certain range) can only be accomplished by one who is willing and able to attack the subject with highly mathematical tools.

The simplest form of filter is shown in Fig. 1. It is essentially an artificial transmission line and contains resistance and inductance in series and capacity in shunt. It may be constructed of inductance coils and condensers, the resistance being an inevitable part of the inductance coils. The resistance is not desirable for it weakens the currents which we wish to transmit.

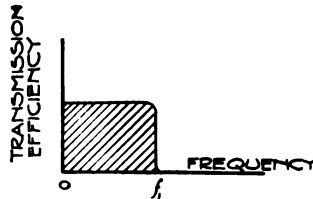


FIG 2

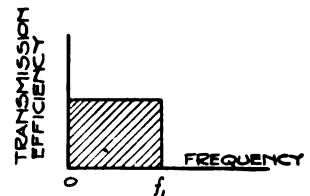


FIG. 3

The currents which we do not wish to transmit are eliminated or suppressed by the action of the inductances and capacities, which is to be described.

This particular type of filter is a "low-pass filter" because it will transmit only frequencies below a certain definite limit which depends upon the values of inductance coils and condensers. That such a combination of inductances and capacities will not transmit high frequencies efficiently is immediately obvious. An inductance coil offers greater impedance the higher the frequency of the voltage which is impressed upon it. It would appear then that high frequencies would be choked by the action of the series inductances. On the other hand, a condenser offers smaller impedance the higher the frequency of the

voltage impressed upon it. The higher the frequency of the current which is flowing in the filter, the smaller becomes the impedance of the shunt condensers, and hence the more effectively do these condensers act as by-passes for the current. Inductances and condensers therefore work together to prevent high-frequency currents from reaching the distant end of the oscillator.

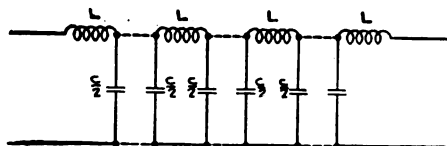


FIG. 4

This much is obvious as to the action of filters. It is not obvious, however, that such a combination of inductances and capacities will operate to transmit with practically equal efficiency all currents of frequency below a certain definite limit, and then fail completely to transmit frequencies higher than this limit. This conclusion can be reached by mathematical study, which is beyond the scope of this discussion, or may be tested by experiment. If one performs the experiment of determining the transmission efficiency of the filter with reference to the frequency of the current which is to be transmitted, results may be plotted as shown in Fig. 2.

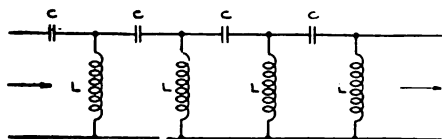


FIG. 5

As one increases the frequency of the current supplied to one end of the filter, there is no change in transmission efficiency until some frequency f_1 is reached. At that frequency there is an abrupt decrease in efficiency. The more nearly the coils are pure inductances, i.e., free from resistance, the more nearly will this graph of transmission efficiency become a rectangular figure like that of Fig. 3.

Although the mathematical analysis of the circuit is beyond the scope of our present discussion, a simple rule may be given for determining the value of f_1 , the "cut-off frequency" of the filter. Let us sketch the filter as in Fig. 4 as if it were made up of a number of consecutive sections, each formed by inductance and two condensers, connected as shown by the dotted lines. Each of the sections consists of an inductance and a capacity in series.

Such a circuit is resonant, i.e., tuned to a certain frequency, and this frequency, which is the resonant frequency of the section, is the "cut-off frequency" of the filter. Its value may be readily determined by the following formula:

$$f_1 = \frac{1}{2\pi\sqrt{\frac{LC}{4}}}$$

where L is the inductance and C the capacity of the coils and condensers shown in Fig. 1. In the tuned circuit of Fig. 4 the capacity is $C/4$ because there are two condensers in series, each of value $C/2$.

Another equally simple type of filter is the "high-pass filter" which is shown in Fig. 5. Here the elements of the filter which were discussed earlier are interchanged so that currents which are being transmitted through the filter meet the series impedance of the condensers, while the inductance coils offer shunts or by-passes for these currents.

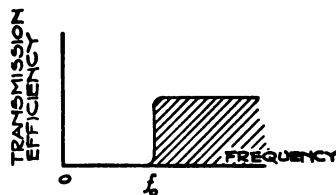


FIG. 6

Obviously enough, such a filter will not transmit a direct current, that is, a current of zero frequency. As the frequency is increased, however, the impedance which the capacity elements offer becomes less. On the other hand the impedance of the inductance coil increases as the frequency rises, with the result that these coils become less effective as by-passes and so divert less of the current if the frequency is high than if it is low.

For such a filter there is the same sort of abrupt change in transmission efficiency

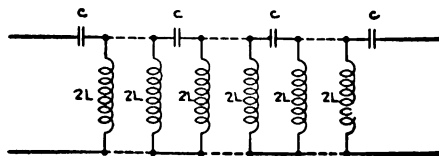


FIG. 7

as the frequency is increased. The characteristic relation is shown in Fig. 6, where f_1 represents the cut-off frequency. This cut-off frequency may be determined in a manner analogous to that pursued in the former case. We first redraw the filter circuit as a series of consecutive sections,

each formed by a condenser and two inductances. If connections between these sections are made as indicated by the dotted line, the circuit of Fig. 7 is identical with that of Fig. 5. The cut-off frequency f_c is the resonance or frequency to which each section tunes and this is given by the formula

$$f_c = \frac{1}{2\pi\sqrt{4LC}}$$

If the inductance, L of Fig. 5 is replaced by two parallel inductances as in Fig. 7, then each inductance must be twice as large. The series circuit formed by a section of the filter of Fig. 7 then consists of two inductances in series with a condenser, the total inductance being $4L$.

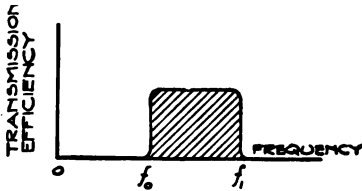


FIG. 8

If it is desired to transmit only currents whose frequencies lie within a narrow band, this may be accomplished by using a low-pass and a high-pass filter in series. The resultant characteristic would then be that of Fig. 8 and only those currents lying between frequency f_c and f_i would be transmitted. Instead, however, of arranging a high-pass and a low-pass filter in series, it is possible to arrange a filter which has in series the series elements of both types of filters and has in shunt the shunt elements of both types. We then obtain the "band pass filter" of Fig. 9.

This filter is the general case from which the other filters may be derived. Dr. Campbell invented the general type of filter. From this invention he derived some 10 or 12 other types, of which the filters previously described are two. In this general type of filter there are involved four elements for which values are to be assigned;

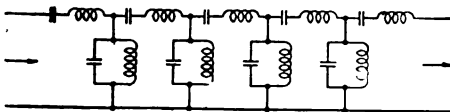


FIG. 9

namely, the series inductance and series capacity, and the shunt inductance and shunt capacity. There are then four variables in the circuit which must be considered when it comes to the design of a filter to accomplish a desired end. The de-

signer must determine the proper values for these four variables by equations which involve the conditions which he desires to meet. Suppose, for example, that he wishes to design a filter which will transmit between two frequencies and have the transmission characteristics shown in Fig. 9. He then has two conditions to meet, and

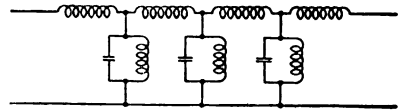


FIG. 10

four things to vary. He has more variables than he needs. In general he also has to meet in his design a requirement as to the impedance which the filter offers to frequencies within the transmission range. This is necessary because the filter is required to work between two parts of a transmission circuit and should have a proper value of impedance. This makes a total of three conditions to be met and four variables, i.e., one more variable than is needed.

It is therefore possible to design a filter of a desired impedance to transmit a desired band of frequencies with only three of the circuit elements which are shown in the general type of filter of Fig. 9. It makes no difference, so far as concerns the calculation, which element is omitted. We may make a band pass filter by omitting the series condenser as in Fig. 10, or by omitting the shunt capacity as in Fig. 11, or by omitting the series inductance as in

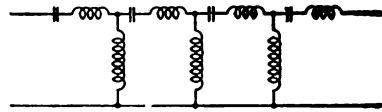


FIG. 11

Fig. 12, or the shunt inductance as in Fig. 13, and have all four filters equivalent so far as impedance is concerned and so far as the range of frequencies which they will transmit. A choice is then made between the four possible designs of Figs. 10, 11, 12, and 13 on the basis of convenience and cost. For example, one of these four designs might require a very large inductance or a very large capacity which would be difficult and costly to construct, and would occupy too much space for convenience. By studying the possible designs and the conditions for use, the designer makes his selection from the different types of filters which will transmit the same band of frequencies.

At present it is interesting to know what really happens when the designer omits

one of the circuit elements of the general type of filter shown in Fig. 9. There are four variables in this filter and in general it will transmit two bands of frequencies and have a transmission characteristic like that of Fig. 14. By the proper choice of the four elements these two bands may be made to overlies one another or become "confluent" as Dr. Campbell originally called them. The four element filter then has the characteristic shown in Fig. 8 and is really equivalent to a low-pass filter and a high-pass filter in series. On the other hand, if one of the elements is omitted, one of the transmission bands is displaced or "relegated to infinity."

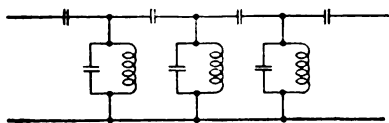


FIG. 12

By means of band filters, it becomes possible to separate in accordance with frequency. We are thus enabled to transmit a number of messages simultaneously over the same telephone circuit, or through the ether, and to separate these messages at the receiving station; for example, in the multiplex telegraph system, known as the carrier current system, there are transmitted over the same pair of wires simultaneously, 10 telegraph messages which are carried by currents of ten different frequencies, all somewhat above those of the voice range; two ordinary telegraph messages, carried by direct currents, i.e., zero frequency currents; and an ordinary telephone conversation. This multiplex telegraph system is in operation between many of the important cities of the country. In every case the separation of the different messages is accomplished by means of wave filters which select a single band of frequencies for transmission to the apparatus to which they are connected and fail completely to transmit all the other messages

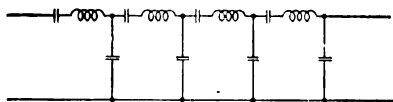


FIG. 13

which may be simultaneously received.

Filters are also used for similar purposes in the multiplex carrier current system of telephony. In this system the same pair of wires serves to transmit simultaneously five distinct telephone conversations, each carried by a different high fre-

quency current, the ordinary telephone conversation, and two telegraph messages.

Filters also permit the operation of a radio telephone station as part of a combined telephone and telegraph system. In this multiplex system of telegraphy and telephony, the telegraph signal is supplied by using an alternating current of 6,000 cycles and arranging to interrupt this current with a key, in the same manner as in ordinary telegraphy a steady current from a battery is interrupted and controlled by a key. As often, then, as a telegraphic dot or dash is to be transmitted, there is sent out from the key a current of 6,000 cycles. This current is added to the complex current from a telephone transmitter which is converting sound waves into electric waves. These two currents together modulate the high frequency radio current.

At the distant receiving station the radio signal is detected, i.e., the modulated radio wave which is received is demodulated. The result is the same mixture of telephone speech and telegraphic signals as is used at the sending station to modulate the radio-frequency, or carrier wave. It is a mixture, however, which is readily separated by the use of filters of the type which has just been described. The detected current at the receiving station is passed into

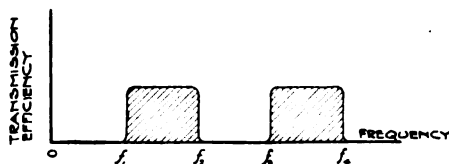


FIG. 14

two filters, one designed to transmit alternating telegraphic currents, and the other only telephonic currents. The filter for transmitting the telephonic currents and discriminating against the telegraphic signals, is designed to allow to pass through itself all alternating currents of which the frequencies are not greater than about 3,000 cycles; i.e., all the frequencies essential to intelligible and natural human speech. This filter, of course, excludes the telegraphic current which is of 6,000 cycles frequency. The other filter transmits only currents of 6,000 cycles or frequencies very close to 6,000.

In the demonstration of this system of combined radio telephony and telegraphy, a radio transmitting set was installed at one side of the auditorium and a receiving set at the other. Transmission took place between two small loop antennae. The circuit at each end was arranged with jacks so that a telephone receiver could be plugged in and an observer could listen to whatever was passing through the circuit

at that particular point. The receiver which was used was not the ordinary head receiver, but instead was a complete equipment of loud speaking telephone receivers such as was used in the Armistice Day Exercises at Arlington, New York and San Francisco. The whole audience was, therefore, able to hear whatever was passing through each part of the circuit. They could

hear the speech wave from the transmitter, or the 6,000 cycle telegraph signal, or the combination of the two; then at the receiving set they could hear the combinations of telegraphy and speech which resulted from the detection of the radio wave; then at the other side of the filters they could hear the speech or telegraph signal depending upon the filter whose output they were observing.

The A.R.R.L. Transatlantics, 1922

By F. H. Schnell, Traffic Manager

FELLOWS, we're going to have some more trans-ocean tests. Our A.R.R.L. Operating Department will conduct the third series of Trans-Atlantic Tests with the co-operation of the English, French, and Dutch amateurs, in December of this year. While no definite dates for the final tests have been decided upon, pending suggestions from England, France and Holland, the probable dates are December 12th to December 31st, inclusive.

During the first ten days of the tests American and Canadian Amateurs will transmit signals for reception in England, France and Holland. The best American transmitters, as determined by reception reports from the European amateurs, will be selected to broadcast the result of the re-

transmitting periods, preliminary tests will be held from October 25th to November 3rd, inclusive.

Instead of requiring each transmitter desiring to participate in the finals to file an entry blank for preliminary tests as was done last year, we have adopted a scheme that will give every transmitter a chance to participate in the preliminary tests—by dividing two and one-half hours (9:30 P.M. to 12:00 midnight) into ten periods of 15 minutes each, during each of which 15-minute periods every test night every transmitter in each inspection district is entitled to transmit. All other districts are to copy signals from stations transmitting.

To qualify for an individual schedule and code letters during the final tests, a trans-

Trans-Atlantic Preliminary Test Schedule by Inspection Districts

	Oct. 25	Oct. 26	Oct. 27	Oct. 28	Oct. 29	Oct. 30	Oct. 31	Nov. 1	Nov. 2	Nov. 3
P. M.										
9:30-9:45	C	1	2	3	4	5	6	7	8	9
9:45-10:00	1	2	3	4	5	6	7	8	9	C
10:00-10:15	2	3	4	5	6	7	8	9	C	1
10:15-10:30	3	4	5	6	7	8	9	C	1	2
10:30-10:45	4	5	6	7	8	9	C	1	2	3
10:45-11:00	5	6	7	8	9	C	1	2	3	4
11:00-11:15	6	7	8	9	C	1	2	3	4	5
11:15-11:30	7	8	9	C	1	2	3	4	5	6
11:30-11:45	8	9	C	1	2	3	4	5	6	7
11:45-12:00	9	C	1	2	3	4	5	6	7	8

"C" Represents Canadian Amateurs. Time given is Central Standard.

ception of signals transmitted by English and French amateurs during the last ten days of the tests, the same as MUU and WII did for us last year.

We will transmit from 7:00 P.M. of one day to 1:00 A.M. the following morning, during the first ten days, and we will listen from 8:00 P.M. of one day until 2:00 A.M. the following morning in the second ten-day period.

That is the tentative plan for the final tests.

Preliminary Tests

For the purpose of determining the transmitters that are to be allotted individual

mitter must show documentary evidence that its signals have been copied at a distance of at least 1200 air-line miles during the preliminary tests. This evidence may be in the form of a post card received from a receiving station located at least 1200 air-line miles from the transmitter.

It may happen that one of our best transmitters is out of commission during the preliminary tests so that it would be quite impossible to produce a record card. In this event, an operator may file application for entry in the final tests by sending in at least two records showing that signals from his transmitter have been copied at a dis-

tance of at least 1200 air-line miles during the months of September or October.

The schedule for the preliminary tests is given in Central Standard Time, which is one hour behind eastern time, one hour ahead of mountain time, and two hours ahead of Pacific time.

Here's what to do during the preliminary tests:

Transmit your own call letters according to the preliminary test schedule for exactly 15 minutes. Start promptly and do not overlap. If you are located in the 5th District you will transmit from 10:45 P.M. to 11:00 P.M. on October 25th; from 10:30 P.M. to 10:45 P.M. on October 26th, and so on through the ten nights. Carry on your regular League traffic until 9:30 P.M., then QRX for the tests. Do not transmit tests at any other time than that shown on the schedule.

While one entire district is transmitting all stations in the other districts are to copy as many stations as possible. After the tests

each night, each receiving station should send a confirming record to every station that was heard at a distance of 1200 air-line miles or over. We will need all the receiving practice we can get before the final tests, as we hope to copy signals from English and French amateur transmitters.

Any station which can show at least one record of 1200 air-line miles or better during the preliminary tests or as mentioned previously, and desires to enter in the final tests, shall furnish the following information when making application for entry:

Complete name and address of owner and station; call letters; type of transmitter (spark, C.W., I.C.W., A.C.C.W.); wavelength; complete description of antenna with ground or counterpoise; power input; and antenna current.

Entries will be received up to noon of November 15th, 1922, but not later. Send your entry to F. H. Schnell, A.R.R.L., Traffic Manager, 1045 Main Street, Hartford, Conn.

Some Further Improvements in My Tuner

By John L. Reinartz, 1QP

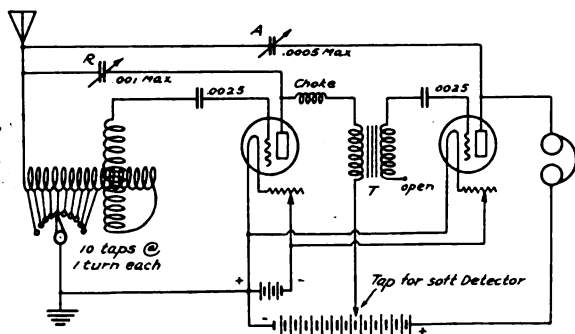
TO make a thing better and more efficient from the amateur's viewpoint is always in order. With the gradual passing of the spark transmitter passes the broad wave, and this has made it possible for me to follow up some early experiments which had indicated that the very good points of the tuning circuit I evolved could be made even better if spark transmission ceased to be.

Our detector tubes are potential-operated and perform best when they have the greatest voltage variation delivered to the grid. This can be accomplished only by the elimination of shunting capacity across the grid circuit inductance. For best results the tuning should not be by means of a variable condenser across the secondary but rather by means of a large variable inductance. Therefore I advise those who have made a tuner following the design in March 1922 QST to remove the inductance in the set and make up and connect in its place a coil made as follows:

On a 3-inch-diameter tube wind 30 turns of No. 18 magnet wire, and insert at one end a revolving portion of 20 turns of No. 13 magnet wire wound on a standard tickler or vario-coupler rotor form, with the two windings connected in series so that tuning may be done by the variometer thus

formed. The antenna is connected to the bottom or starting point of the stator, and taps brought out every turn for ten turns and connected to ground as shown in the diagram, thereby providing the untuned antenna circuit as described in my previous tuners.

It will be noted that the plate inductance has been eliminated—it is not necessary



when the circuit is used as shown. In fact, even in the condenser-tuned circuit shown in QST for last March the plate inductance may be done away with if the spider-web coil is rewound with No. 18 wire so as to lower the resistance.

The above paragraph contemplates an

average amateur aerial. If a big aerial is used it will be desirable to wind a separate coil of 10 turns and place it at the bottom of the vario-coupler and connect into the plate circuit as was done in the March diagram.

The wave-length range of the set described is approximately 150 to 350 meters. If it is desirable to embrace the broadcast wave of 360 meters, a few more turns should be wound on the rotor. The grid condenser is a fixed mica of .0025 or .003 mfd. R is the regeneration-control condenser, a 43-plate variable.

Users will find this new circuit even better than my other two and I recommend it for use on 200 meters, at which it will function equal in audibility to any tuner made yet retaining the same ease of adjustment embodied in the other types. It seems to be so extremely conserving of voltages, however, that the detector grid is often paralyzed by spark stations within twenty miles, and if the builder is likely to have much nearby spark QRM the condenser-tuned model is preferable, simply because it delivers less voltage to the grid. Where spark interference is not bad, however, the new set will perform several times better.

I also wish to present an idea in audio-frequency regeneration shown in the amplifier circuit in this diagram. Audio-frequency energy is fed back capacitatively to the antenna circuit by a 23-plate variable condenser, A , from the anode of the amplifier, in much the same manner as condenser R controls the radio-frequency regeneration. The other necessary changes are the insertion of a mica grid condenser of .0025 or .003 mfd. in the lead to the amplifier grid and the omission of any connection from the low-potential terminal of the secondary winding of transformer T .

The main disadvantage of this circuit is that it is awfully rough on a pair of Baldies. It is easily equal to a two-stage audio amplifier at adjustments of condenser A which preserve the natural tone of the telegraph signal or which reproduce phone signals without noticeable distortion, yet by increasing the capacity of condenser A the tube will approach audible oscillation and an incoming telegraph signal may be made to "trigger it off" on its "howl-frequency" with an audibility which is little short of terrific. This action can be controlled exactly as desired by condenser A ; if advanced too far the set will howl continually; at low values there is no tendency to howl but only undistorted audio-amplification; at some intermediate value the trig-

ger-effect is easily found. This feature is particularly helpful in C.W. reception, as the beat note of an incoming signal can be adjusted to equal the "howl-frequency" and thus disproportionately amplified, interfering signals on adjacent frequencies being pushed down into relative insignificance. The signals produced by this trigger-action are sharp and clean and without "whiskers."

I use an ordinary Acme amplifying transformer, a U.V. 200 detector with 16 volts on the plate, and a VT-1 amplifier with 90 volts.

I wish to take this opportunity to express my thanks to the hundreds of amateurs who have written their appreciation of the remarkable results obtained with the older types of tuners described by me, and I hope they will find their reward in better results from this newer type.

Editor's Note: It is impossible for us to keep up with this man Reinartz. Since preparing the foregoing for publication he has dropped around with another "trigger circuit" that knocks its predecessors cold.

Fig. 2 shows the arrangement, and just for old time's sake we have shown the March Reinartz tuner with condenser tuning, but minus the plate inductance which may be omitted if the other coil is wound with No. 18 wire or larger. R is the re-

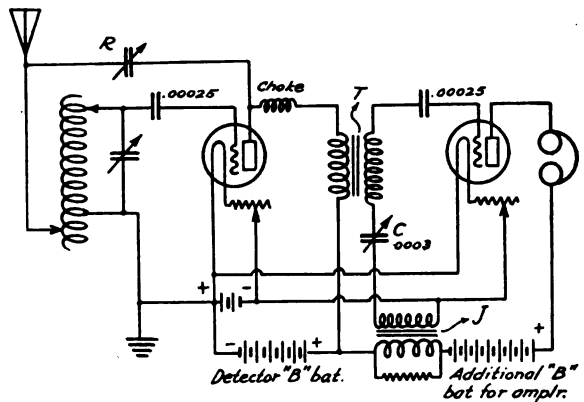


FIG. 2

generation control. Again we have a detector and a one-stage amplifier coupled by the audio transformer T . The secondary circuit of the amplifier contains the tricks, in the form of a second audio transformer, J , whose primary is in the plate circuit of the amplifier in series with the amplifier "B" battery and preferably located between the detector tap and the negative terminal of the additional "B" battery for the amplifier, as shown. The secondaries of the two amplifying transformers are in series with a small air variable condenser, C , say 7

plates, and with the completion of the circuit back to filament we have coupled the plate and grid circuits thru the transformers so that the tube will howl at an audio frequency, except that its tendency to do so may be controlled nicely by the throttle-condenser C.

This circuit, it should be noted, is *not* an audio regenerator. It is entirely valueless for phone reception. It is a sensitive audio oscillator which is "triggered off" by incoming signals, particularly C.W. signals. As a trigger circuit it is much better than Fig. 1 above, and the note or tone may also be controlled by the condensers. It is not critical as to type of tube, almost any kind working well in the amplifier. For transformer *T* Mr. Reinartz uses a Coto-Coil and for *J* a Jeffries. The primary impedance of *J* is too high, apparently, for this purpose, and results are greatly improved by shunting it with a leak of 2000 to 4000 ohms.

This arrangement gives terrific signals. Watch out for your ears in trying it.

We might as well convert this section of the magazine into a Reinartz Symposium. Several more interesting items respecting this very useful little tuner have come to hand and are presented hereinafter.

K.B.W.

Radio Amplification with the Reinartz Tuner

RECENTLY we mentioned that the Reinartz tuner had hit England and that its construction was described in detail in the May 13th issue of *The Wireless World and Review*. In the July 8th issue of the same magazine Mr. G. G. Blake gives a description of his own Reinartz set

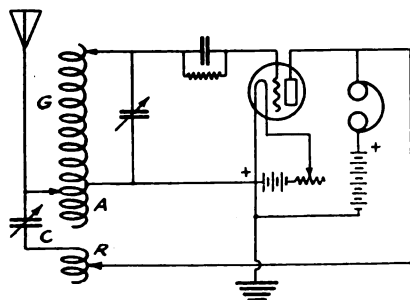


Fig. 1

to which he has added one stage of radio frequency amplification with great benefits. Mr. Blake says:

"It is one of the most selective tuners with which I have experimented, and almost entirely prevents jamming. I have listened

in amongst the shipping on an openly tuned set and heard several ships jamming one another, and have then changed over to the Reinartz Tuner and been able to separate them quite easily and hear the signals from any one of them without the least interference.

"Against this advantage of great selectivity, and the fact that it reduces atmospheric interference to a minimum, this set reduces the signal strength to about two-thirds of its original value, so that al-

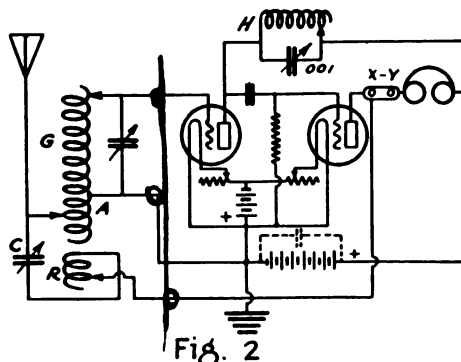


Fig. 2

though it is excellent for receiving loud signals or telephony from a powerful broadcasting station, it is of little use in picking up the weak telephony from amateur stations. To overcome this defect I have added one stage of H.F. amplification which has very greatly increased the strength of weak signals and telephony.

"Fig. 1 shows the ordinary single valve connections for a Reinartz Tuner. As this has already been fully described, the diagram needs no further explanation. It will be remembered that the grid inductance, aerial inductance, and magnetic reactance R are all wound on one former (and in the same direction).

"Fig. 2 shows the addition of one stage of H. F. amplification. This set is intended for the reception of telephony from the broadcasting stations and amateur short wave transmissions; its range is therefore anything from just below 180 meters up to 650 meters, and the number ofappings on the inductance is reduced to a minimum. All are wound with No. 22 double-cotton-covered wire on a 3 in. former. The grid inductance G has threeappings, one 20 turns from the point where the earth wire is attached to the inductance, one at the 35th turn, and the last one which is the end of the inductance is 50 turns from the earth.

"The portion of the inductance below the earth terminal marked A on the diagram is shown with an adjustable connection to the aerial. I find, however, in practice that a fixed 10 turns serves every purpose, as the aerial circuit functions aperiodically.

"Now, with regard to the magnetic component of the reactance circuit. In order to conform strictly to the Reinartz plan, R should be wound on the same former as G and A, except that owing to the addition of the second valve, the direction of its winding must be reversed. I have tried it wound in this way with a fixed 40 turns and obtained quite good results; but I have found it decidedly better to wind it on a separate former a little smaller in diameter than that used for the inductance, and fix it permanently just inside the aerial portion of the inductance. The best position which will suit all wave lengths is arrived at after the set has been assembled by setting the variable reactance condenser C, which should have a capacity of at least 0.001 mfd., at the midway point of its scale, and then introducing the reactance coil until reaction just occurs. After this, reactance is regulated entirely by altering the capacity of C.

"High frequency amplification is obtained by means of auto-transformer coupling. It will be seen that the plate circuit of the first valve contains an inductance H, tuned by the variable condenser (capacity 0.001). The inductance H is wound with 36 turns of double-cotton-covered copper wire, 16 gauge, on a 3 in. former. It is shown adjustable on the diagram, but in practice a fixed coil of 36 turns will cover the entire range of wave lengths for which this tuner is intended. This inductance H should be arranged at right angles to the grid inductance and as far as possible from it to avoid induction effects.

"Two terminals X and Y are shorted by a copper connector, and when it is desired to use the set in conjunction with an audio-frequency amplifier the connector is removed and X and Y are connected to the terminals of the amplifier's input transformer. It will be noted that the high resistance telephones are left connected in order that they may act as an impedance.

"The simplest method of tuning in a station is to buzz a wavemeter to approximately the required wave length, and having set the reactance condenser C just over half in, tune with the secondary condenser and the auto-transformer condenser simultaneously until the buzzer is most loudly heard in the telephones. It will be found that there is only one very sharp point on the scale of each condenser for each wave length. The signals are then brought up to the loudest possible value by varying the capacity of the reactance condenser C. Having tuned in the wavemeter its buzzer is stopped, and a very little further variation of the other two condensers brings in the signals from the distant station."

It surprises us to discover the Reinartz tuner favorably commented upon for its sharpness of tuning. Personally we have not found it so, particularly when some-

thing like 10 turns is included in the antenna circuit as advocated by Mr. Blake. In fact, we use ours ordinarily with either 1 or 2 turns in the aerial circuit and the tuning, while much better than the ordinary so-called single-circuit tuner, does not compare in sharpness with a three-circuit tuner. Nor have we ever been particularly entranced with the action of the Reinartz set in the reception of telephony; our chief endorsement of it is in the reception of C.W. telegraph signals where its smoothness and ease of adjustment are such as to make possible the handling of A.R.R.L. relay traffic on C.W. with even greater ease than ever spark traffic was handled on a three-circuit tuner.

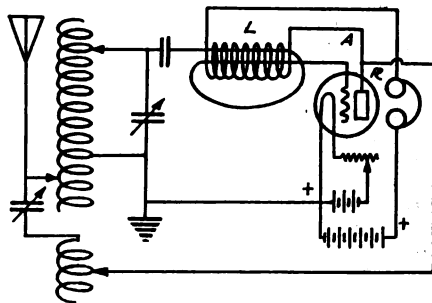
But for whatever purpose the many builders of Reinartz tuners use them, we believe this simple explanation of the addition of a stage of radio-frequency amplification will be interesting and helpful.

—K.B.W.

Simple Audio Regeneration

NOW comes one John L. Reinartz who, being duly sworn, deposes and says that he knows an easy method to double the strength of signals received on a Reinartz tuner.

It does all of that, and it is easy. Altho the method probably is applicable to almost any kind of tuner, its special application is to the Reinartz because in that tuner the audio and radio circuits are separated. The idea is to introduce a little audio regeneration—see the diagram.



The anode-voltage supply in the Reinartz tuner is in shunt to the radio regeneration circuit—from the anode one connection R leads to the tickler inductance and reaction condenser, while another connection A supplies the energy from the B battery, in series with which are the telephones. This phone circuit thru A is an audio circuit, and into this path is introduced an air-core winding L, of considerable inductance. It may be the secondary from a small spark-coil or some similar winding of many turns. Such windings generally are of fine wire, involving considerable resist-

ance, but coils with resistance as high as 2000 ohms have been used with excellent results.

Thru this inductance L the audible telephone currents flow. If then this coil be brought in inductive relation to the grid lead, audio regeneration will occur. The grid lead may be threaded thru the center of the coil with improved results. If it be wound thru the coil for two or three turns, still better effects generally are obtained. In other words, the coil L is the primary of an audio-frequency feedback transformer, the secondary of which is formed by the turn or two of grid lead which is threaded thru it. Too much reactance can not be used in the grid circuit, as it is primarily concerned in conveying

the radio-frequent impulses to the grid, but the number of turns can be determined easily by experiment—it is that number that gives the loudest signals without distortion and without affecting the control of the radio-frequency circuits.

This is only one of many valuable little stunts which may be done on the remarkable Reinartz tuner. To such of our readers as have not been impressed by it heretofore we again commend it for C.W. reception and refer all hands to the description in QST for March, 1922.

K.B.W.

(*Altho this article was written prior to Mr. Reinartz' on pages 12-13, it describes a tested method and we decided to present it too.*)

Another Month of Super-Regeneration

By K. B. Warner

ANOTHER month of experimenting with the fascinating business of super-regeneration has passed. In close touch with amateur work the country over, as we are, we cannot feel that the progress has been particularly satisfying. Very promising results have been got in certain directions, tho, and at least we are able to prophesy that in another month we will have news. QST's contest for the best descriptions of super-regenerative sets closes October 1st and we have enough reports in hand to justify us in saying that our prizes will be well awarded and, what is more, that directions for getting real results will be available then.

Over most of the country success has been rare. The average super set is a reproduction of Mr. Armstrong's "Case II" set described at the R.C.A. meeting and frankly intended for broadcast reception. Perhaps it should not be particularly surprising that it brings in concerts very QSA over jumps of about 25 miles and is a dismal failure in DX. Occasionally a skillful operator will get a DX fone on it but no DX sparks are reported. Long distance amateur C.W. is copied, to be sure, but it seems in spite of the super effect rather than because of it. This particular arrangement so far has proved entirely unsatisfactory for amateur work and in our opinion is not worth while, even with the improvements described in two articles in September QST, except for the remote chance that it may lead to some helpful discovery.

It goes without saying that we amateurs don't want to waste money with a super arrangement which is expensive, noisy and critical, when our simpler regenerative sets are superior. However, if we can improve our present sets so that the super effect is

obtainable therein, particularly if this can be done with small effort and in a controllable manner, that is "something else again." *The one-tube super is making good!* This is especially gratifying because it means that our present tuning arrangements may be retained, methods with which we are already fully familiar, and the only additional equipment needed is some means for generating the "variation frequency" and introducing it into the circuit. Such sets are in operation today on regular amateur aeriels, and in at least a couple of cases are bringing in the DX to beat the cars. The one-tube circuit is the most promising by any odds.

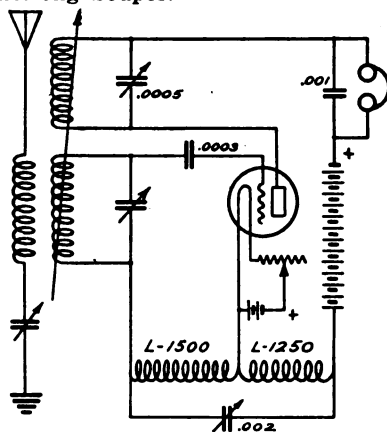
There is certainly opportunity for experiment here. Bearing in mind that the idea is to supply the regenerative amplifier with a second or "variation" frequency, numerous schemes present themselves to mind. In his first and second cases, Mr. Armstrong uses a separate tube to generate the variation frequency; on page 25 of September QST a circuit was suggested employing a buzzer or chopper for this purpose; one experimenter we know is using a separate oscillator tube connected to an ordinary iron-core audio-frequency amplifying transformer whose secondary is connected in the detector grid circuit with a by-pass condenser across it; and at least one chap is making the "souper" work with not a single piece of extra equipment! He has his tickler tightly coupled and turns on the filament current; as the rheostat is advanced a click is heard as the tube goes into oscillation; the rheostat is turned further and a second click is heard, accompanied by a squeal, the squeal which by this time is recognized as one of the accompaniments of most super arrangements. Indeed in this

case it is a true super-effect, for this set with no loop nor aerial and using only a 2½-inch coil has brought in DX amateur CW in New England from as far as the 4th and 9th Districts. It is very interesting to consider what is taking place in this set. For some reason the tube howls, a condition normally extremely obnoxious. We don't know whether the frequency is determined by the inductance of the phones with their shunt capacity or whether it is because the grid leak is too high a resistance for the grid condenser used; at any rate when the tube is "crowded" it squeals. This squeal constitutes a second or variation frequency in that circuit, and it produces the super-regenerative effect just as nicely as if it had been elaborately generated in a separate oscillator and painstakingly introduced into the detector circuit thru a vernier coupling control. By adjustment of the rheostat the audibility of the squeal may be reduced to where it is not bothersome, and after the first few hours it is hardly noticed. The use of a separate detector coupled to the first tube by a radio-frequency pick-up coil should eliminate it entirely but it has not been considered worth the effort.

The efforts of most experimenters with the one-tube circuit have been in the direction of giving the tube a second frequency by introducing coupled "variation-frequency circuits" into the grid and plate leads. This is done with the usual honeycomb coils and big condensers. Instead of tuning condensers across each honeycomb better results are had by shunting a single large variable across both coils as shown in the diagram herewith. How the radio frequency currents find their way to filament is a mystery, but they do. This circuit acts very much like our ordinary regenerative with a stage or two of R.F.A. ahead of it; it brings in signals inaudible on a two-stage A.F. amplifier, brings in weak signals much better, and doesn't amplify very strong signals as much as A.F.; tube noises are almost nil; and static audibility, on an aerial, increases with the signal amplification and not like it would on A.F. amplification. The adjustment of the variation-frequency circuit can remain undisturbed over the entire amateur band.

Mr. A. L. Groves, 3BID, originator of this arrangement, says that with the variation condenser at low values the set acts like an ordinary regenerator preceded by just a little radio-frequency amplification—it is sharp, perfectly quiet, and will receive spark, phone, or C.W. equally well. Increasing the variation condenser, the tickler coupling, and the capacity across the tickler, the amplification increases rapidly, sparks getting louder and louder, becoming scratchy and finally disappearing altogether; phones become louder, at length to

jumble up and disappear, and only the C.W. telegraphy is left, and it may be brought up to an audibility limited only by the tube and a practical limit set by the static obtaining at the moment. With increasing amplification the broadness of tuning increases markedly, but as only C.W. is received at such adjustments this is no handicap. And in spite of such amplification Mr. Groves insists that its DX is better than its QSA—he is copying dozens of DX C.W. stations in daylight on a Meyers tube with 90 volts on the plate. 3BID says he is never going back to the plain regenerator—which is the biggest boost we have as yet heard for the Armstrong Souper.



Incidentally, we dislike to believe that the effect of super-regeneration is attributable to variation in the resistances of the circuits. To our mind it is much more logical to consider that the variation frequency shifts the locus of tube action to a different point on the characteristic curve or to an entirely different curve, or both.

Consider the familiar "Case II," where the positive resistance of the grid circuit is said to vary at variation frequency. In this case the variation frequency is present as an A.C. voltage of a second frequency, impressed upon the grid of the regenerative amplifier. As we see it, this variation-frequency voltage actually displaces the axis of grid oscillation from its normal point and varies it between two other points on the curve, where, for example, the tube may first be permitted to oscillate and create an undistorted amplification, and then be shifted either to a point on a bend in the curve where rectification takes place and where oscillation is choked out because the energy is insufficient to overcome the circuit losses, or even to a negative region where the plate current is completely cut off. The rapid variation between these two conditions would serve to amplify without uncontrolled oscillation in a manner otherwise as explained by Mr. Arm-

strong. Examination of this theory will show that the proper bias for the grid of the regenerative amplifier is a value midway between the point of best detection and the amplification point that can be reached by the available variation-frequency amplitude, and will show the necessity of using tubes of a type capable of performing this shifting of grid biases without permitting the grid to become positive with respect to the filament.

In "Case I," where the negative resistance of the plate circuit is said to be varied, it would seem that on the contrary what happens is a variation of the plate voltage at variation frequency. This plate voltage variation is introduced by the plate circuit of the oscillator tube, and is capable of varying the potential on the plate of the regenerative amplifier between, say, twice its normal value and zero. The result is that the regenerative amplifier shifts, at variation frequency, to totally different characteristic curves, and the effect is much as in the previous case—for example, the action might shift between a point on a bend in the curve, automatically providing rectification thru distortion, and where the energy is not sufficient to overcome the losses in the circuit and permit oscillation, and another point well in the straight portion

of the curve where undistorted amplification and free oscillation are permitted.

All this may be exactly what is contemplated in the explanations of the variation of resistances, but we cannot satisfy ourselves that the supper effect can be obtained by a resistance effect entirely diassociated from changes in the grid-voltage-plate-current characteristics of the tube. In fact we see no manner of analyzing the problem that can escape the fact that the regenerative amplifier also does the detection, which, it goes without saying, is at marked variance with Mr. Armstrong's explanation.

"Case III," where both the positive and negative resistances are said to be varied, unravels into a combination of shifting grid axes and impressed plate voltages which shift in value. We confess an inability to visualize the plate current in such a circuit.

Mr. Boyd Phelps, assistant editor of *QST*, shares the writer's guilt in this new conception of the action of super-regeneration. The whole thing probably will come out in the wash some day.

Next month we will announce the winners in our Super-Regeneration contest and present the First Prize manuscript. We believe it will be a very valuable article to the amateur.

A 122-Foot Tower

By LeRoy Moffett, jr., 5ZAV ex-5HK

I BELIEVE one of the most necessary parts of a DX station is the antenna system. It will be found that most well-known DX stations have a properly designed antenna system.

One of the most important considerations is to have a higher center of capacity and this means a high support for the antenna. Altho self-supporting towers for this purpose cost more than guyed masts, I believe they are better in the long run because of the area necessary to guy a good mast and because of the energy absorption by the guy wires.

The tower described in this article has a square base 20 ft. on a side, the corners resting on concrete pillars. These concrete pillars are about 9 ft. deep in the ground, 4 ft. square at their bases tapering to about 18 inches at the top, and each one has a 6-inch pipe about 8 ft. long imbedded in it and protruding about 9 in. above the concrete. Three or four holes are drilled in the top of each 6-in. pipe to pass lag-bolts for fastening down the legs of the tower.

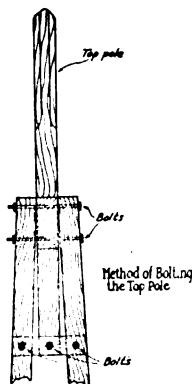
The actual construction of the tower is of 5x5-34' fir timbers originally intended for making oil derricks but ideal for our purpose. Their actual dimensions were $4\frac{1}{2}$ x

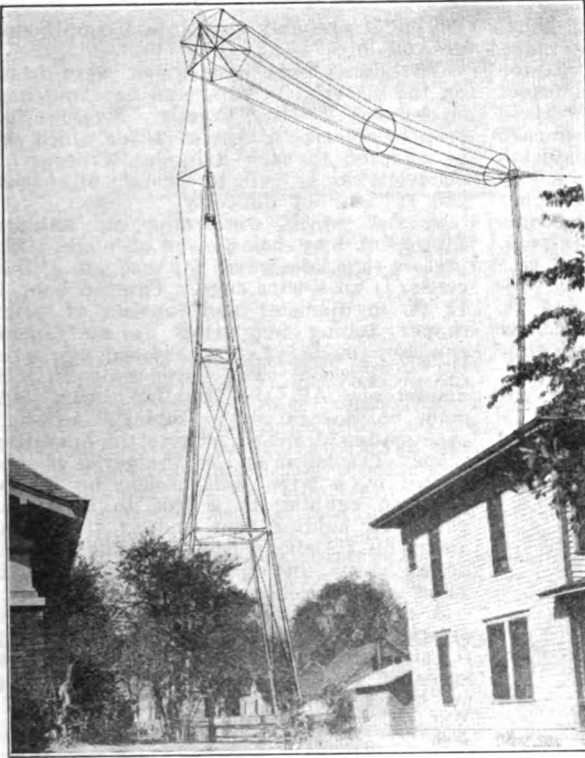
$4\frac{1}{2}$ by $34\frac{1}{2}$ to 35 ft. long. They should be given one or two heavy coats of good paint.

The top pole should be a good straight timber free from knots. Starting about 10 ft. above the bottom the corners are knocked off by means of a draw-knife, making it octagonal in cross-section. A pulley should be securely fastened to its top.

The timbers in the tower construction are fastened together by means of $\frac{5}{8}$ -in. bolts 10 inches long at the bottom of each

joint and by a U-piece clamped around the top of joint, as shown in the detail sketches. The lap at each joint is $3\frac{1}{2}$ ft. A set of four cross-pieces is necessary at each joint, and these are the same $4\frac{1}{2}$ x $4\frac{1}{2}$ material. These four pieces should be 12 ft. long for the first set and 5 ft. long for the second. At the top of the tower proper

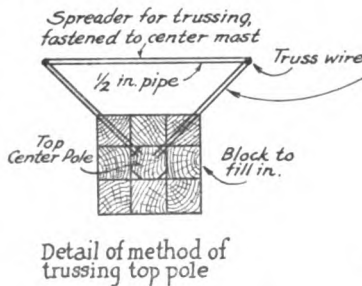




By comparing the photo and the working drawing an excellent idea of the construction of this tower may be gained.

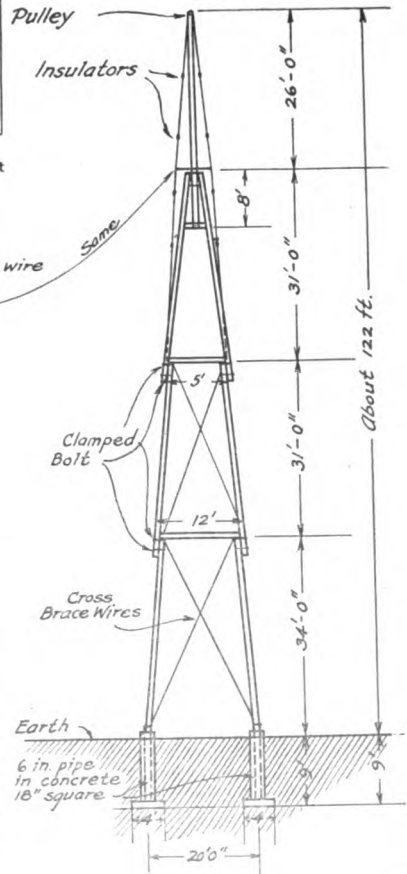
the four corner timbers are held together by means of 15-in. bolts passing thru one of the timbers, then a block, and then thru the adjacent timber. About 7 ft. below the tower top a footing for bolting the bottom of the top-pole is constructed by bolting $4\frac{1}{2} \times 4\frac{1}{2}$ blocks to the legs.

The following is the procedure observed by us in the erection of this tower. First a 34-ft. stick was set up as a temporary gin-pole, by which a 65-ft. section was raised consisting of the bottom and intermediate sticks forming one corner of the tower. This 65-ft. section was then firmly guyed and in turn used as a gin-pole for raising a 96-ft. section comprising one entire side-member of the tower. (The 34-ft. gin-pole was then taken down). The 96-ft. section was then guyed and a 12-ft. cross-piece bolted between it and the 65-ft. section at the first joint. The other two 96-ft. sections were next raised, each being set on its individual base, the lag-bolts screwed in to hold it firm to the pipe bases, each guyed at the top, and the 12-ft. and 5-ft. cross-pieces run across to the adjoining sections and bolted up.

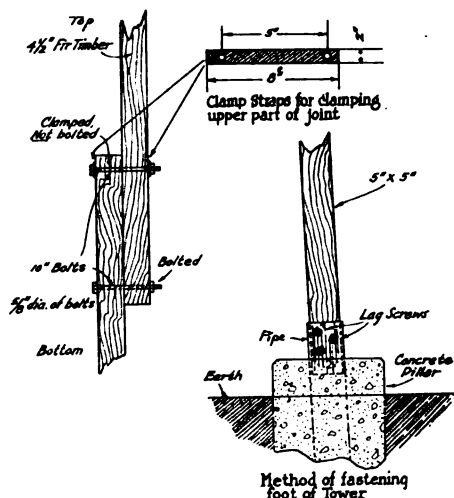


We now have up three 96-ft. sticks and one 65-ft. stick, with four 12-ft. cross-pieces and four 5-ft. cross-pieces in place, and are now ready to string the brace wires. These are made by twisting four strands of No. 10 galvanized wire together, but a good cable may be used. Sixteen of these about 40 ft. long are needed, also two about 16 ft. long and two more about 8 ft. long, all fitted with husky turn-buckles. Each panel in the bottom two sections is trussed by stretching these cables cornerwise between the two adjacent poles of each section, and the shorter cables are run diagonally across to opposite sticks at the 34-ft. and 65-ft. levels, parallel to the ground, to keep the tower from twisting out of square.

The top stick of the fourth side of the tower is now ready to be put in place. This is done by attaching the block and tackle at the 96-ft. height, taking hold of



the stick a little above its center, and hoisting it to position, where it is bolted in place. No brace cables are necessary in this top section. This completes the four sides of the tower. The tops of the sticks are held together by running 15-inch bolts from each timber thru 1-ft. blocks of the 5x5 material, as shown in the detail sketch, in such a way as to provide a square top about 14 inches on a side with a square hole in its center about 5x5 thru which the top-mast can pass. All four sides are securely bolted in this manner. The four short cross-pieces previously referred to are then placed 7 ft. below this and a fifth piece bolted across two of these so that the bottom of the top-mast can be fastened in place.



Now we are ready to raise the top piece. Fasten the tackle to it and raise it up inside the tower to the 96-ft. level and temporarily fasten it in place with a few feet protruding thru the hole in the top of the tower while the truss wires are put in place. There are two of these cables, fastened to the top of the top-mast and brought in to the 65-ft. level, trussed out from the top-pole on a frame of 1/2-inch pipe so as to form the two corners of a square on the side away from the pull of the antenna. The tackle is then attached lower down on the top-mast and it is hoisted up in place and fastened in its final setting and the truss wires tightened up. These should be well broken up with strain insulators. Flexible quarter-inch cable is used for the aerial hal-yard. The top-mast can be easily let down if trouble is experienced with the pulley, etc.

To put up a tower of this kind requires the services of two laborers and one man to superintend the job and do the climbing. The timbers in it cost \$4.30 each. At present I haven't the complete cost of the

job but it probably runs into a couple hundred dollars.

The dimensions here given were based on the material in hand and need not necessarily be followed exactly. My idea has been to describe a type of tower which can be adapted to each individual's needs. I believe it can be built to a height of at least 150 ft. without difficulty.

A few words concerning my antenna equipment may not be out of place. The present one, designed for use on a Z-license, is an 8-wire cage. The top hoop is 11 ft. in diameter and consists of 1/4-in. copper tubing supported by an 8-point spreader made of four crossed sticks of 1 1/2 x 3/4 wood. The lower hoop is 3 ft. diameter. All the smaller hoops are made of 3/8-inch copper tubing. A 7-inch cage lead-in drops directly to the operating room. The lower end of the aerial is supported by a wire, well broken up by insulators, running to a tree in the front yard and holding that end of the aerial about 60 ft. above ground. The over-all aerial length, including lead-in, is 140 ft. (For special-license station—Ed.)

A counterpoise of 17 wires is suspended directly under the aerial at a height of 9 ft. above ground, supported from a 14-ft. spreader at the station end and fanning out to a spread of 40 ft. at the far end.

New Books Received

"Elements of Radio Telephony," by Wm. C. Ballard, Jr., Asst. Prof. of Electrical Engineering, Cornell University; 132 pp., 5 x 7 1/2; McGraw-Hill Book Co., Inc., New York; \$1.50.

An elementary little volume written on the tide of popular interest in broadcasts to tell in simplified form what happens when messages are sent and received, what the apparatus is like which produces these effects, how it operates, and what apparatus is necessary. The accomplished amateur already knows most of the things said in this book but we should remember that it wasn't written for us. For the novice it is excellent. It will let him know what happens in his apparatus when he turns the knobs and will answer his growing technical questions as he progresses towards amateurdom.

"How to Retail Radio," by the Editors of "Electrical Merchandising;" 226 pp., 5 1/4 x 8 inches; McGraw-Hill Book Co., Inc., New York.

All about how to sell radio apparatus to folks who don't know anything about it, even if you don't know anything about it yourself. The authors take themselves seriously, however, and altho as amateurs

(Continued on page 29)



WELL, well, well, Brethren and Cistern, did you read last month about QST's Subscription Contest? We're conducting a REAL one- We want more folks to know about us and our A.R.R.L. and we're making it immensely interesting for our amateur members who will help us get them. In our September issue we told the story in all its hair-raising details, about how we are knocking all previous subscription-contest records for a row of stupid-degenerators by offering a whole string of

50 PRIZES TOTTALLING \$2000.00

The contest runs for quite a spell so if you haven't climbed on the band-wagon yet there is still plenty of time to ride to glory with us and share in the fun. We figure that our ten thousand A.R.R.L. members who know all about QST are capable of forming themselves into a squadron of subscription-takers which will put your eye out. As material for these ten thousand men to work on we have a field of a couple of million radio fans who are interested in radio and blindly floundering around trying to find a radio magazine which will do something besides show them pretty roto-gravure pictures of broadcast entertainers—a magazine which tells them something *interesting*—all primed waiting for one of our gang to present a copy of QST for inspection and take their subscription for a year or two. With the opening of the fall season and the return of cool weather this is a most propitious time for a contest and we think thousands of subscriptions can be got for the asking.

Of course it goes without saying that we can't afford to give away all this money unless we get the subscriptions but we know they can be got and so we're perfectly willing to set aside so much from each sub the same as if it were commission to a regular agent, and apply the fund thereby created to the purchase of prizes for the fellows who do the work for us—A.R.R.L. co-operation.

HERE'S THE DOPE

What do you need for your station? Whatever it is, QST proposes to buy it for you. We're going to buy \$2000 worth of

America's best radio apparatus from QST's advertisers and give it to the winners in our contest. We don't know what it's going to be—it's going to be what YOU want. We're not going to offer a transmitting set as first prize and a receiving set for second prize because the fellow who wins first prize may need a receiver badly and not need a transmitter at all—we're going to let *him* be the picker. Whatever he wants is his. In other words, the \$2000 in prizes will be awarded in the form of any desired radio apparatus selected from the catalogue of QST's happy family of advertisers. The distribution is as follows:

Grand First Prize, \$300 worth of apparatus

2d Prize	\$200	"	"	"
3d Prize	\$150	"	"	"
4th Prize	\$100	"	"	"
5th Prize	\$100	"	"	"
6th Prize	\$100	"	"	"
7th Prize	\$75	"	"	"
8th Prize	\$75	"	"	"
9th Prize	\$75	"	"	"
10th Prize	\$75	"	"	"
11th Prize	\$50	"	"	"
12th Prize	\$50	"	"	"
13th Prize	\$50	"	"	"
14th Prize	\$50	"	"	"
15th Prize	\$50	"	"	"
16th Prize	\$25	"	"	"
17th Prize	\$25	"	"	"
18th Prize	\$25	"	"	"
19th Prize	\$25	"	"	"
20th Prize	\$25	"	"	"
21st Prize	\$25	"	"	"
22d Prize	\$25	"	"	"
23d Prize	\$25	"	"	"
24th Prize	\$25	"	"	"
25th Prize	\$25	"	"	"
26th Prize	\$10	"	"	"
27th Prize	\$10	"	"	"
28th Prize	\$10	"	"	"
29th Prize	\$10	"	"	"
30th Prize	\$10	"	"	"
31st Prize	\$10	"	"	"
32d Prize	\$10	"	"	"
33d Prize	\$10	"	"	"
34th Prize	\$10	"	"	"
35th Prize	\$10	"	"	"
36th Prize	\$10	"	"	"

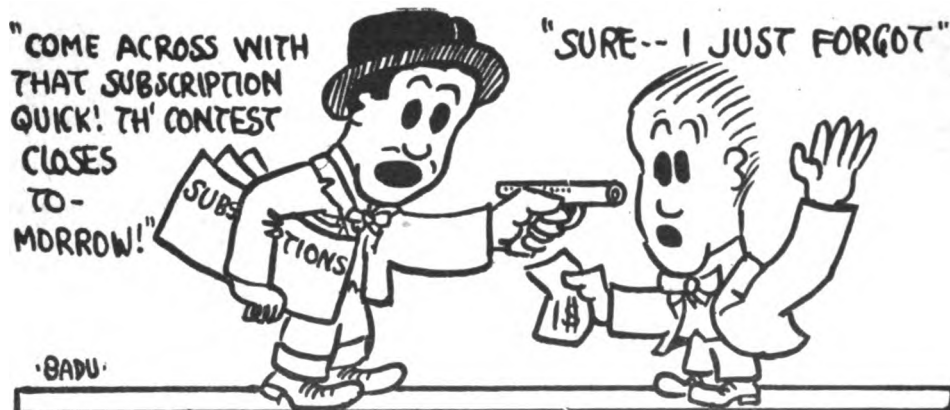
37th Prize	\$10	worth of apparatus
38th Prize	\$10	" " "
39th Prize	\$10	" " "
40th Prize	\$10	" " "
41st Prize	\$10	" " "
42d Prize	\$10	" " "
43d Prize	\$10	" " "
44th Prize	\$10	" " "
45th Prize	\$10	" " "
46th Prize	\$10	" " "
47th Prize	\$10	" " "
48th Prize	\$10	" " "
49th Prize	\$10	" " "
50th Prize	\$10	" " "

\$2000

Say, O.M., what would you do if you were told you could have \$300 worth of new apparatus? We're going to be real mean and tempt you. Do you know that \$300 will buy you everything you can think

big hundred dollars, and a hundred dollars means a pile of apparatus when a fellow makes up a list of what he needs—it isn't many of us who can drop casually into a supply store and buy a hundred dollars worth of apparatus whenever the fancy strikes us. Yet nothing will give QST greater pleasure than to send \$100-worth of equipment to you—stuff of your own picking. By the way, O.M., how'd you like to have a nice lil C.W. set with four 5-watt tubes—you know, perfectly capable of covering from 6ZAC to French 8AB under the right conditions—how'd you like that? Parts for a mighty nice one, including tubes and meters, for a hundred washers. Even if you won tenth prize and wanted such a C.W. set, the \$75 tenth prize is still enough to buy almost everything necessary.

What do you think of super-regeneration? Or have you your doubts about this radio-frequency amplification stuff? Would



of for a 100-watt C.W. set—tubes, sockets, motor-generator, transformer, meters, everything from soup to nuts? Or, supposing you have an A1 transmitter, stop a min and consider that a super-heterodyne wouldn't make a bad receiver for this next winter and reflect upon the fact that \$300 will buy everything that the human mind can devise in the way of parts for rigging up a real one! Or suppose you are a laboratory hound but need the jack for some real meters and precision instruments—some real condensers and some inductance standards and a capacity meter and things that you dream of but don't know when you're going to get—QST is perfectly willing to hand them to you on a silver platter for a little hard work on your part. Think of the third prize, even—if you need anything in ordinary receiving equipment, for example, that will buy you the finest short-wave regenerative tuner in America and add a bang-up good two-step amplifier to the bargain. Suppose you didn't win anything higher than sixth prize, it's a whole

you like to try them and see for yourself? Costs money to experiment—unless you let QST buy your stuff for you. Just think—even down to the fifteenth prize the amount is \$50.00!

You see, fellows, it's you chaps who are practical amateurs to whom we are making this offer—you're the folks who need apparatus and at the same time you're the ones who can get out and tell the world about QST. Do you get our idea? We're not offering you a nice pretty rotary gap for a prize when mebbe you junked the spark a year ago—we're letting you DO YOUR OWN PICKING—but by heavens if you want a spark set all you have to do is hump a little and we'll send you a Type E transformer and a made-to-order he-gap on a big synchronous motor and a condenser that will hold the beast and an oscillation transformer out of 1-inch copper pipe and a barrel of porcelain insulators for an antenna—just let your imagination run riot: you can't think of anything we won't get for you if you'll do your part.

Even if you live in a little village and your possibilities are extremely limited, we're offering a total of FIFTY prizes and surely there's lots of room for you. Even those last prizes are worth \$10 and that means that for a very small effort on your



DON'T MISS LINING UP EVERYBODY AT THE CLUB

part you can have the makings of a step of amplification or that meter you've wanted, or a couple more tubes, or a REAL pair of phones—doesn't make any difference to us.

MINIMA

Now about those "threshold minima"—of course we have to require a minimum number of subs to qualify for the various prizes, as we can't afford to let some bird walk away with our \$2000 for ten subscriptions. The First Prize goes to the contestant turning in the greatest number of subscriptions, the Second Prize to the one with the second greatest number, and so on down to the Fiftieth Prize, BUT—In order to be eligible for the Grand First Prize of \$300 you must turn in at least 500 subscriptions.

In order to be eligible for the Second Prize of \$200 you must turn in at least 400 subscriptions.

In order to be eligible for the Third Prize of \$150 you must turn in at least 300 subscriptions.

In order to be eligible for Fourth, Fifth or Sixth Prize of \$100 each, you must turn in at least 200 subs.

To be eligible for any of the four \$75 Prizes, Seventh to Tenth inclusive, you must turn in at least 150 subs.

For any of the five \$50 Prizes, Eleventh to Fifteenth inclusive, you must turn in at least 100 subs.

To be eligible for any of the \$25 Prizes, of which there are ten from the Sixteenth to Twenty-fifth inclusive, you must turn in at least 50 subscriptions.

To be eligible for any of the twenty-five \$10 Prizes, numbered from Twenty-sixth to Fiftieth, inclusive, you must turn in at least 25 subscriptions.

In our previous subscription contests our Main Prize has been \$50. Just think—in this one the prize values even down to the Fifteenth Prize are as high as \$50.00! If we offered merely the last 36 prizes listed, this would be better than any of our previous contests, but we've added 14 bigger prizes running into real money for the men who mean business.

Now let's put all of these ideas into the form of regulations to govern the contest:

RULES OF THE CONTEST

(1) This contest is open to any member of the A.R.R.L., but only to members. Entries will be received only from individuals.

(2) The contest opened September 1st and will close at midnight on November 10, 1922. To be fair to contestants in the western states, subscriptions addressed to us may be placed in the mails in your town up to midnight of that date—the cancelling stamp of your post-office will be the guide. Subscriptions filed in the mails after midnight of Nov. 10th will not be counted.

(3) Fifty prizes totalling \$2000.00 in value will be awarded as hereinbefore described, subdivided as we have listed; and in order to qualify for any prize listed the minimum number of subscriptions specified therefor must be turned in. The right is reserved to withhold any prizes not qualified for by the submission of the specified minimum of subs.

(4) Only full-year subscriptions at \$2.00 each will be received in this contest. They may be new subscribers, renewals, or



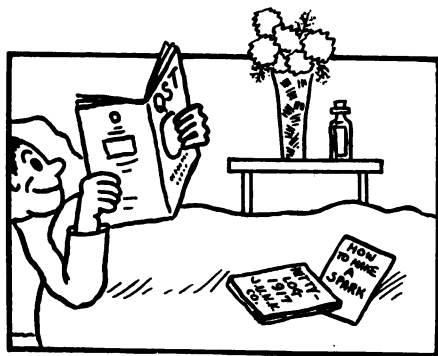
MAKE IT BE YOUR NAME THAT THE EDITOR PUTS ON THIS ORDER

extensions of existing subscriptions. Full amount must accompany the filing of all subscriptions.

(5) To enroll in this contest, submit your name and address to the Contest Manager, QST Subscription Contest, 1045 Main St., Hartford, Conn. You will be sent immediately a few sample copies of QST and a supply of special subscription blanks. All subscriptions must be filed on these special blanks, which must bear your name in order that proper credit can be given you. Try to anticipate your needs for further blanks by requesting them sufficiently in advance, but if you run short WIRE US.

(6) The prize winners will be announced in *QST* for December. The value of the prizes will be awarded the respective winners in the form of any apparatus, equipment, supplies or parts which they may select from the catalogs or advertisements of any *QST* advertisers, and will be delivered without expense to contestants. If a contestant desires apparatus valued in excess of the prize won, *QST* will purchase it for him if he will deposit the difference in value with us.

Fellows, this thing is a cinch! The country is lousy with folks wildly interested in radio and you ought to get subscriptions from every one you meet in not more than two minutes. Every aerial marks at least one prospect! *QST* will do these folks worlds of good, because they're looking for



something nowadays that will answer their questions and not merely amuse them with pretty pictures, yet they've never been told about *QST*. That's all you have to do. Every little village has a hundred or more of them and in the cities they run into the tens of thousands—really! You've seen hundreds of single-wire aerials as you go about your home-town, haven't you? Put some sample copies under your arm, your sub blanks in your pocket, and armed with your best smile you drop around and see these folks. Presto! a subscriber—just like that! You don't have to know them—you're not limited to your personal friends—your prospects have a sign hanging outside the house right now—every aerial means a ten-to-one shot for a sub.

Then think of the crowds around the radio supply stores at noon—go get 'em! And the membership of your radio club, which is many times what it was when we held our previous contests—line 'em up; your amateur friends—get them to help you, solicit their own renewals to *QST*. Do you know that the winner of the First Prize in our last contest lived in a very small

town and won first honors by taking subscriptions from all his friends *over the air*? You can do that too. Why, when we ran our last dinky little contest it was a hard job to sell subscriptions; of course every radio amateur would subscribe but you had to dig to find folks outside the amateur class who were interested; once in a while you would find that your doctor or minister had a streak of wireless interest but it was rare. To-day? Shucks, there're **MIL-LIONS** of them!

QST's idea in this contest is to provide intensely interesting possibilities for the contestant in every kind of locality and particularly appealing incentives for real workers. Have you spare time which you would like to turn into radio-cash? Here's your chance. Are you out of work and yet wild to get some new stuff for this winter? Oh boy, here's your meat! In fact, daggone it, we aim to make this contest so interesting that it's worth any ham's time to take a week off and do nothing but work for us—it's awfully hard to earn \$300 in a week any other way. If you're serious about this thing you can think of dozens of ideas which will help you: you're not necessarily limited to your own home town; borrow the family flivver some day and chase over to the near-by towns and go over them with a fine-tooth comb too, and don't miss any aerials on the drive over; and what's the matter with a little ad in your home-town newspaper, if you mean business?; there's no limit to the possibilities!

IT'S NOT TOO LATE

The announcement of this contest is just out as we write these lines. Each mail shows that about a dozen more fellows have decided they'd like to have *QST* help outfit their station for this winter. Is your name entered as a contestant, O.M.? If not, it's high time you got in on the swim. Here's the chance of a lifetime. Don't let it get by you. It isn't too late, because there are plenty of prizes and actually millions of prospects, and the contest doesn't end until November 10th. We believe that any man who reads these lines can go out and get a hundred subscriptions in a few hours. Honest, it's just that easy—try it.

Man, dear, this is the chance of a young lifetime. It isn't every day in the year that somebody offers to buy you whatever you want for your station, yet—we repeat it—we **WANT** to. All you have to do is hump a little. Drop a postal at once to the Contest Manager and ask to be enrolled and to send you some special subscription blanks PDQ first-class mail and meanwhile start lining up your friends. You'll be sorry if you miss this opportunity. Can we send the blanks?

CONTEST MANAGER,

QST Subscription Contest
1045 MAIN ST., HARTFORD, CONN.

Multi-Stage Amplifiers

By M. C. Batsel*

A Paper Presented before the Radio Club of America,
Columbia University, New York

SEVERAL methods of coupling the successive tubes of multi-stage amplifiers will be discussed. The uses of each type including the useful frequency range will be mentioned.

When considering the design of an amplifier the first thing to be determined is the type of tube to use. A complete set of plate-current-grid-voltage and grid-current-grid-voltage curves for different plate voltages should be obtained, also the internal plate-filament circuit impedance vs. plate voltage obtained. From these curves the plate battery voltage and negative grid voltage necessary for the proper operation of the tube as an amplifier can be obtained.

Figure 1 shows some curves of an amplifier tube. The grid must have a sufficient negative D.C. voltage applied to it to insure that the maximum amplitude of A.C. voltage to be applied to the grid will not cause the tube to take grid current. Sufficient plate voltage must be used to produce a fairly straight plate-current-grid-voltage characteristic but must not be so high as to produce saturation.

Resistance Coupling

The resistance type of coupling between tubes will be considered first. Resistance coupling has much to recommend it when amplification absolutely without distortion is necessary. The value of resistance coupling in this connection is due to the fact that the amplification is independent of the frequency. This is true at least for all audio frequencies if the coupling condensers are properly proportioned.

A resistance-coupled amplifier circuit is shown in Fig. 2.

Tubes to be used in resistance-coupled amplifiers should have a reasonably high voltage-amplification factor. A high voltage-amplification factor means a high internal plate-to-filament resistance; this requires a high value of coupling resistance and in turn a higher plate voltage. Due to the number of batteries required the plate voltage that it is practical to use usually determines the amplification factor and impedance of the tubes used in designs for general use. A coupling resistance equal to the resistance of the tube plate-to-filament circuit or possibly as much as 100% higher is satisfactory. The grid resistances are necessary in order to maintain the grid at a fixed D.C. voltage with

respect to the filament. The resistance will also tend to relieve the grid of any positive charge that might be accumulated by leakage from the plate battery thru the coupling condenser.

The voltage amplification per stage of resistance coupling is equal to $\frac{1}{2}$ the voltage-amplification constant of the tube when the coupling resistance is equal to the impedance of the tube. The resistance would have to be 10 times the impedance of the tube to give 90% of the voltage amplification factor. It is obvious that the plate circuit battery voltage would be out of reason

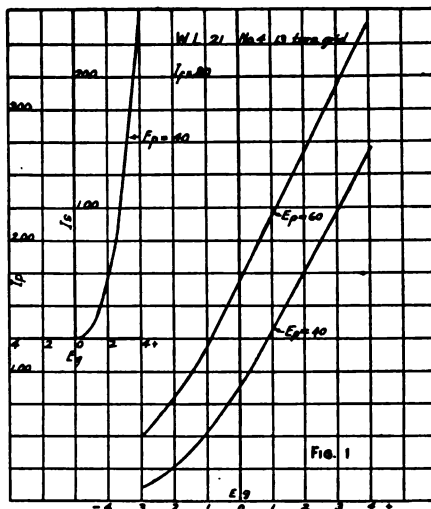


Fig. 1

if such a value of resistance were used.

The plate voltage must be sufficient to produce a linear relation between grid voltage and plate current.

Choke-Coil Coupling

Figure 3 shows a circuit using choke-coils or reactances for coupling between stages. The circuit is the same as shown for the resistance coupling, the resistance being replaced by reactances. The reactance can be so designed that the D.C. resistance is practically negligible and the A.C. impedance very high for even very low frequencies. A choke-coil having an inductance of 50 to 75 henrys can be designed so that the efficiency is not impaired at the high audio frequencies by the capacity of the coil. It is an advantage to use an open-core choke coil in order that the

*Engineer, Westinghouse Elec. & Mfg. Co.

coil can be made small and compact without saturating the iron of the core. By using sectionalized windings it is possible to keep the natural period of the winding entirely above the audible range even when the inductance is as high as 75 henrys.

The amplification is 90% of the voltage-amplification factor of the tube when the reactance is twice the impedance of the tube.

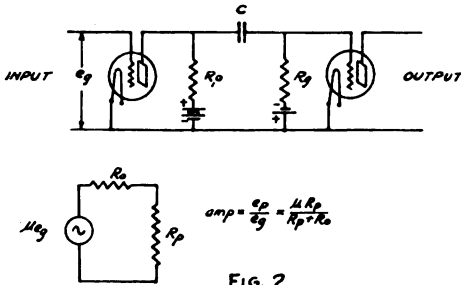


FIG. 2

Choke coils can be designed for use at radio frequencies and by keeping the distributed capacity at a minimum it is possible to obtain amplification over a considerable frequency range even below 1000 meters wave length.

Transformer Coupling

Coupling by means of transformers is desirable in many audio frequency amplifiers and is to be preferred for radio frequency. One advantage is that the voltage can be stepped up in the transformer. It is desirable when using transformers, as will be shown later, to employ tubes having a low impedance. While low-impedance tubes have a relatively low voltage-amplification factor it is possible to realize a greater total amplification per stage using transformers than by any other means.

Figure 4 shows a transformer connected in a circuit and the equivalent circuit of a transformer and tubes. As a transformer is intended to be used to step up the voltage it is necessary to make the step-up ratio as high as possible. If the secondary is first taken into consideration it is obvious that a great many turns are desirable in the secondary winding. The limiting factor is the highest frequency to be amplified. The resonant frequency of the secondary winding may be made the geometric mean of the frequency band to be amplified. If the range is 100 to 10,000 cycles the resonant frequency may be 1000 cycles. The equivalent circuit of the transformer and tube may then be represented by that of a parallel resonant circuit. "C" is the combined capacity of the winding and grid-to-filament capacity of the tube multiplied by the square of the ratio of transformation. The reactance of this circuit at the lower frequency is that of the inductance alone. With increasing frequency the re-

actance increases and reaches a very high value, acting as a resistance at resonance, and then decreases again and finally at higher frequencies its value is practically that of the equivalent capacity. In order to explain the action of a transformer so designed that the secondary is resonant, the variation in the A.C. voltage across a coil having an inductance equal to the inductance of the transformer primary when a constant voltage of varying frequency is impressed upon the grid of the first amplifier tube will be shown. The tube may be considered as a generator having an impedance R . The voltage generated will therefore divide between the resistance R_0 and the reactance ωL of the transformer primary. At low frequencies ωL is small and most of the voltage generated is lost as RI drop in R_0 , the internal plate-filament resistance. As the frequency is increased ωL increases and when ωL is twice the R_0 the RI drop in R_0 is less than 10% of the voltage generated. It is obvious then that no matter how great the reactance may be made the voltage across the reactance cannot be greater than μe_g .

The addition of the secondary winding and connections to the tube only affects the impedance of the primary as would the addition of the equivalent capacity C . The reactance then becomes.

$$X_p = \frac{L_p \omega}{1 - L_p C \omega^2}$$

While the capacity causes the reactances of the winding to increase to a great value and then to decrease again as the frequency is increased, the increase above the value for which there is practically no RI

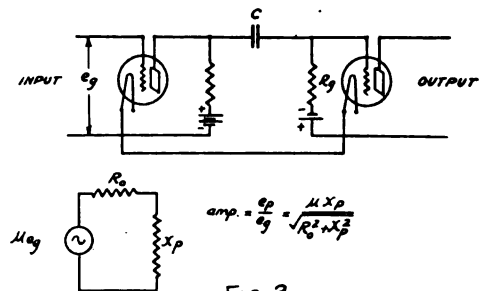


FIG. 3

drop in R_0 can not change the voltage across the primary winding. The secondary voltage is equal to the voltage across the primary multiplied by the ratio of turns.

Transformers can be designed to give very little variation in amplification for different frequencies or to be sharply resonant. The secondary winding can be the same in either case. If the primary inductance is sufficiently high to produce little RI drop in R_0 at low frequency and

the secondary winding is not resonant at a frequency so low that the reactance decreases too rapidly as the frequency is increased, the amplification-against-frequency curve is as shown in Figure 5, Curve 1. The second curve (2) shows the effect of decreasing the number of primary turns.

By decreasing the primary turns still further, the peak is made sharper and the maximum amplification greater because the step-up ratio is increased if the primary

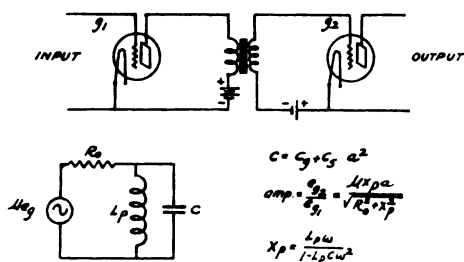


FIG. 4

turns are decreased while the secondary turns remain constant. It is desired to emphasize the fact that the resonance effect is only due to the transformers being connected to a generator having a high internal impedance. If the tube plate-filament resistance could be zero, no peak could be obtained. The only currents supplied to the transformer are the magnetizing current and a load current that is delivered to a capacitive load. If the internal plate-filament impedance of the tube is decreased the effect on the variation of amplification with frequency is the same as the effect of increasing the number of primary turns.

The secondary voltage is practically equal to the voltage across the primary multiplied by the ratio of transformation. If the transformer is well designed there is no leakage and therefore no chance of series resonance. The resistance of the windings, core losses, and dielectric losses modify the above statements slightly. Transformers afford a practical method of coupling tubes for cascade. It is not practical to use more than two or at most three stages of audio-frequency amplification. The last step may consist of a power tube if a powerful loud-speaker is used. For signals weaker than can be received with audio amplifiers, radio frequency should be used.

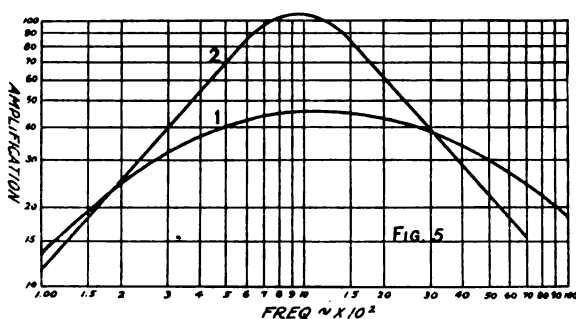
Radio Frequency Amplification

The greatest obstacle to be overcome in the design of a radio-frequency amplifier is the self-oscillations set up when a radio-frequency amplifier is connected to a tuned circuit, the oscillations being due to feed-

back thru the inter-electrode capacities. Other feed-backs may be effectively eliminated. If a transformer is used the amplifier will tend to oscillate at a frequency at which the transformer behaves as an inductance. The inductance in the plate circuit then gives rise to regeneration as in the well known regenerative tuned-plate circuit. The nature of the feed-back has been explained by Miller, Ballantine and others. Figure 6 shows the equivalent circuit of a tube with its inter-electrode capacities, also a diagram of the phase relations of the plate current and various voltages acting in the circuits.

Starting with I_p we may draw $R_p I_p$ representing the RI drop in the plate circuit. 90° ahead of this voltage we may draw $X_p I_p$ representing the voltage across the reactance X_p . The sum of these voltages is in phase with e_g . e_p is equal and opposite to $I_p X_p$ and causes a current to flow through C_m , the capacity between plate and grid. This current flows to the filament thru the circuit connected between grid and filament when the tube is connected to a tuned loop. At resonance the grid and filament circuit is of the nature of a resistance, being a parallel resonant circuit. C_m is very small and the current thru C_m will be a current leading the voltage e_p in phase by nearly 90° since the impedance of C_m is very great. The voltage drop over the resonant grid circuit, which behaves as an effective resistance, will be in phase with e_g and therefore tend to regenerate or sustain oscillation. Only when the plate circuit reactance is inductive can the feed-back occur in the proper phase to regenerate.

The voltage e_p is 180° out of phase with



μe_g when the impedance X_p is replaced by resistance and in that case it is not possible to induce a voltage in the grid circuit thru C_m that would be in phase with the original voltage e_g .

Transformers for wave lengths below 1000 meters must be designed so as to keep the distributed capacity of the windings themselves and between primary and

secondary windings at a minimum value. We have found iron cores to be useful even at a wave length of 300 meters. The iron must be thin and the laminations well insulated. The permeability of the iron is

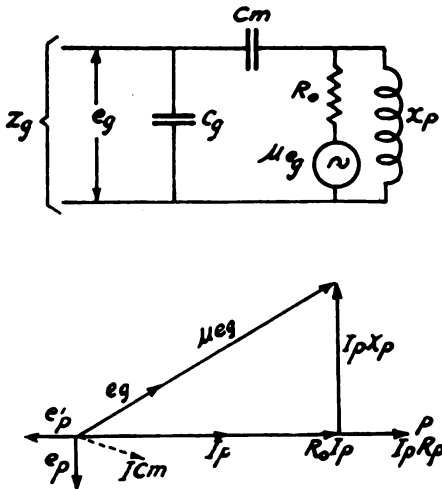


FIG. 6

of some advantage as the primary and secondary windings can be located farther apart than they could be in air for the same coupling or flux linkage. The losses in the iron core are a benefit rather than

a loss as the impedance of the transformer primary may be such that the phase of the plate voltage with respect to the grid voltage may never be right for regeneration.

It is interesting to note that the regenerative action can occur only in the tube connected to the tuned loop circuit provided all the transformers are similar. The feedback occurs at a frequency for which the transformer behaves as an inductance and when a resistance or its equivalent is connected between the grid and filament.

Radio-frequency amplification has not been widely used by amateurs because it is very difficult to secure amplification on 200 meters. For wave lengths from 250 meters and upward radio-frequency amplification is entirely practical. For the reception of broadcasted entertainment a loud speaker is usually desired if vacuum tubes are used and audio-frequency amplification is necessary for the operation of a loud-speaker. It is not practical to use more than 3 or 4 vacuum tubes requiring considerable current for filament heating, as the storage battery would be very expensive to purchase and to maintain. For this reason radio-frequency amplification has not come into general use, the regenerative circuit with audio-frequency amplification usually being used instead.

There are many places where the use of a loop or coil aerial is desirable or necessary and then radio-frequency amplification is necessary. This is true in a great many congested districts and apartment houses.

Break-In for C.W.

By "BeeP"

WHY don't more of you fellows use some form of break-in system? With C.W. it works out beautifully! Most of the old objections to it are removed and because of its many advantages and ease of operation it is lots of fun.

Not a million nights ago a station which we shall designate as A* called "CQ" and announced that he had traffic going south. Before he finished calling, station B* answered and told him "QRV." A immediately broke to B and started with the message. When he got about half-way thru the message B had local interference so he sent one dash which stopped A and then said ". . . QRM." Both operators remained quiet until the QRM stopped, neither changing his tuning. Presently B gave the last word he received correctly followed by "K," and A continued from that word. Several messages were exchanged in somewhat the same manner, breaking at times due to doubtful reception

of a word. For a third station to keep track of both transmitting stations required acrobatic tuning manoeuvres which only a Reinartz tuner could hope to do.

From the above incidents selected from many a few of the advantages of break-in will be seen. Actual use will make them even more apparent. A receiving station in doubt about a word will not need to worry and perhaps miss other words and when his turn comes, call, sign, and ask for a repeat starting at such-and-such place and ending with a certain other word, but instead breaks as soon as the word has been sent and it is immediately repeated. This saves lots of time and laborious calling, lessens interference, and because of the ease of breaking on words that might otherwise be guessed at, more accurate messages result and more of them are delivered to the correct address.

Now there are many methods of operating a successful break-in system. Some amateurs who have trouble with their

transmitter paralyzing their detector tube have been able to use a small loop in the secondary circuit to balance out this energy. All kinds of double-contact keys have been devised which when connected in the ground circuit act also as a switch for connecting the receiving set to the aerial when in the "up-position." However, as most amateurs find a long low wire best for receiving it is natural to find that the most common break-in used is accomplished by simply listening with the receiving set on this other aerial. This works very nicely except when listening close to the transmitting wave.

The receiving aerial should be at right angles to the transmitting aerial to pick up the least energy. Where the receiving aerial is close to the transmitting aerial or lead-in it may be found that the antenna current jumps when the receiving set is tuned to the same wave. The thing to remember in this connection is that antenna current and radiation are not the same thing. In every case we have investigated, the station was weaker at a distant station when the antenna current was increased in this manner, showing it to be a matter of absorption and not useful radiation.

Once again the Reinartz tuner is of great value as in it the antenna circuit is aperiodic and not tuned to the transmitting wave under any ordinary conditions; hence on a separate wire for break-in work it does not affect the transmitter nor cause heavy currents in the receiver. It was stated in the July issue that it was thought the Reinartz tuner would make an excellent combination with the Beverage wire. This has been tried out on a short wire at 1HX and found to be the correct dope and, furthermore, because the wire runs away from the transmitting aerial and is not directional towards the transmitter, no trouble is experienced in receiving on any wave, even on the same wave as the transmitter.

The foregoing are a few suggestions as to how breaking-in can be done. In some cases where the energy absorbed in the coils of the receiving set from the transmitter is sufficient to render the detector inoperative, the aerial and ground leads may be reversed so that the incoming energy absorbed in the receiving aerial is of such phase relation as to buck the energy induced in the coils of the set, thus allowing receiving to be successfully done closer to the transmitting wave. A heavier grid leak will make the "come-back" of the tube less sluggish. There are probably several other kinds used not mentioned above. If so, QST will be glad to hear about it. We believe it is worth while and it surely adds a lot to the enjoyment of traffic handling.

NEW BOOKS RECEIVED

(Continued from page 20)

we have never appreciated the desirability of introducing modern merchandising methods in the electrical supply house where we buy our stuff and are perfectly content if the lad behind the counter can tell us what it's made of and who made it and discuss it with us as a fellow-ham, we admit that if this book by its good advice improves the perfectly horrible retail radio conditions to be found in every town, its authors rate recognition in our Hall of Fame.

It is the only book of its kind we have seen and the experience of its authors makes it authoritative anyway. It gives comprehensive advice on policies, financing, equipment, stock, advertising, selling and demonstrating, installing, speeding sales, record-keeping, etc. The authors recognize the amateur to the extent of advising radio stores to fit up a "clubroom" with a reading table, blackboard, lots of chalk, and some chairs, where hams can congregate and chew the old sock. "The amateur is a very powerful factor in the building of a radio retail business and his good will is something which must be fostered at all hazards." 9SP must've told'em that.

"Radio for the Amateur." by A. H. Packer and R. R. Haugh; 207 pp. 5 x 7½; Goodheart-Willcox Co., Inc., Chicago.

We object to the title of this book. The authors have made the mistake of considering the wireless newcomer an amateur. In fact so elementary is this book, so much does it resemble a text for a kindergarten, that it might be entitled "Radio for the Dumb-bell." It consumes 207 pages in leading its readers up to vacuum tubes. Nevertheless it has its very distinct place in the economy of things—in fact, judging by most of the novice listeners we've seen, we'd say this book is exactly their speed. In the most elementary of styles it explains everything about simple reception and transmission and does it as well as one-syllable words will permit. The drawings are just as simple, and most of the steps are illustrated and explained by well-chosen hydraulic analogies. Anybody who cannot gather the fundamentals of radio after reading this book should quit trying and get a job somewhere as a radio expert.

"The ABC of Vacuum Tubes," by E. H. Lewis, radio instructor, East Side Y.M.C.A., New York; 132 pp., 5 x 7½; Norman W. Henley Pub. Co., N.Y.C., \$1.00.

Exactly what its title implies: an elementary and practical book on the theory and operation of vacuum tubes as detectors and amplifiers, explaining non-mathematically the fundamental principles upon which all V.T. circuits are based. In our obser-

*Call furnished on request.

vation most practical amateurs are sadly deficient in tube theory; this little book will fill that need. It is one of the few recent "novice books" which are likewise of interest to the amateur field. The author presents some excellent characteristic curves in explaining his theory, and practical A.R.R.L. members who get a headache whenever the charcoalistic-curve is mentioned would do well to secure this book and enjoy the

pleasant sensation of being posted. The book is likewise an admirable supplement to the reading of the novice who has mastered his texts on generalities—V.T. theory is the next step.

Ho hum; not much doing this month. Wish somebody would write something about amateur radio.

K.B.W.

"And the Land Shall Be Visited by Plague and Pestilence"

By "The Prophet"

IN a village in the land which the Great God Antennius, God of Radio, thru his earthly agents, the Department of Commerce, hath named the Eighth District, there dwelt certain youths of the Tribe of the Patriarch, known as The Old Man, and of the Young Squirt, and the Worshipers of the Almighty Wouff-Hong and the terrible Retty-Snitch, who at an early age did suffer sorely from the visitations of that dread insect, the Radio Bug. And, verily, the disease did spread until several of the wisest and fairest (?) of the young men of the country-side had fallen victims. The antics of the stricken were amusing, tho terrible, to watch. They did suddenly seem possessed of the devil, for, verily, they rushed about with wonderful speed; they raised poles of fearful altitude and construction in their back yards; they did dig up the family flower garden and sink therein awesome quantities of all the metals which man, in his cunning, hath discovered; they begged from their sires pieces of gold and silver wherewith to purchase more junk, neither was paper scorned; they did make all manner of evil noise, yea, even unto the early hours of the morning. And the neighbors and kin of these youths gnashed their teeth and said unto them, "Now, wherefore makest thou such awful screechings and buzzings and sputterings and howls thruout the night watches? Verily, thou must, indeed, be possessed of the devil!"

But, verily, the bite of the Radio Bug is deep and in spite of prosecutions and tortures these youths did prosper mightily until, finally, they builded unto themselves mighty sets of great power. The youth who aforesometimes squeaked upon a squeak box now hammereth right lustily upon the key of a C.W. set and calleth all of his friends, yea, even unto the Sixth District, and doth handle many messages of great import. He maketh new records and smasheth old ones. He joineth clubs of other bugs and there absorbeth and giveth

off much wisdom. He sitteth up at night and poundeth his key and weareth the cans, yea, even unto the fourth watch. He taketh great pride in his set, which is right. He expandeth his chest and saith unto all who pass by, "Lo, look upon me. I am a bug."



The God of QRM

And as it is in this village, so is it all over this land.

But, lo, time passeth unto the space of about two years after the European eruption and the Great God Antennius, God of Radio, did look unto his Traffic Manager and spake unto him thusly, "Look upon these Amateurs. Verily, they do think they are the whole cheese. Now will I show to them the error of their ways and, may-

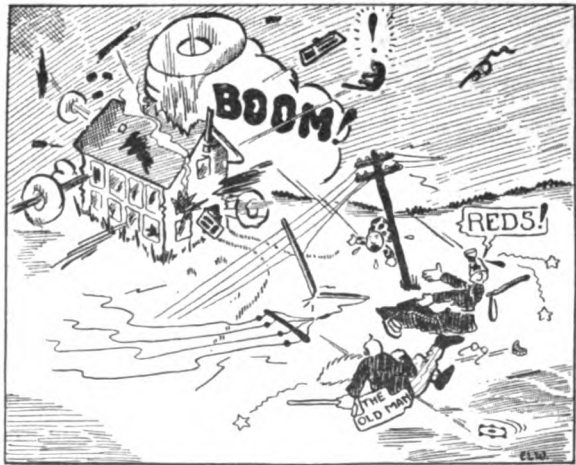
hap, lead them to better. I will send unto them a great plague and I will not allow one Bug to escape."

Then did he sit him down to meditate. Suddenly he sprang high in the air and cracked his heels together thrice and shouted, "Eureka!" which meaneth in the Grecian tongue—"Now will I fix these amateurs," for verily he had concocted a wicked scheme—the *Radio Phone*.

So it came to pass that in the space of a few weeks the minds of men became flooded with the whispers of the Great Antennius and the first broadcasting station did open up. But what sayeth the prophets? "It never rains but it poureth." And truly it is spoken, for in the space of a few moons there were scores of these obnoxious despoilers of the ether in operation and then did some wise persons among the Gentiles invent the science of Radio. Then an avalanche started and, verily, the multitudes did purchase sets, yea, the butcher, the baker, the candlestick maker, and those in authority and friends of those in authority. And it came to pass in those days that the air was filled with all manner of sounds and screeches and grunts and growls and howls and squeaks and roars and scratches and fizzes, in addition to the already over-sufficient confusion caused by the traffic handled by the men of commerce and the Amateurs. And, since the sets used by the would-be listeners were mostly of doubtful vintage, they got the benefit of all this babble. Then, even as the Great Antennius had planned, they did rise up in their wrath and ignorance and blame it all on the Amateurs. And they sent runners and messengers to the consuls and præfects and all those in authority and demanded that all Amateurs be forthwith fed to the Royal Menagerie. Yea, verily, if an Amateur ventured only to pound upon his key he was to be thrown into the dungeons. For the Listeners-to-Music reasoned thusly, "Now wherefore are these Amateurs who have sprung up in such alarming numbers since *we* invented Radio? And whyfore does their wireless interfere with our Radio? For is it not of more import that we listen to the outpourings of the stations that do broadcast than that they relay messages and improve upon their sets? For what know we of these dah-de-dahs, anyway?" And, verily, some in their ignorance, did even try to silence the men of commerce and the ships upon the great waters. Then they sat them down and wrote again to their friends in the Courts of the Law and implored them to cause all Amateurs

to be beheaded or at least imprisoned.

Then were the Amateurs in a sad plight, even as the Great Antennius had intended. It became an act of great courage to transmit at all, for if they did so, were they not certain to be invited to a neck-tie party? Verily, the handling of traffic became more and more difficult since many Amateurs had given up in disgust and others had turned traitor and joined the ranks of the Listeners-to-Music (?). With the exception of a few men of brave and strong heart and possessed of shot guns, transmitting became almost a lost art.



"... all manner of evil noise, yea, even unto the early hours of the morning."

Then spake the Great Antennius again to his Traffic Manager and said unto him, "Verily, I now believe the Amateurs have learned the lesson that I intended them to learn, to wit—that they do not compose the whole of the cheese. Therefore will I strengthen their hearts and cause them to fight against this great plague which is upon them and to regulate it to its proper place; since, verily, it doth now appear to me that it is possible for the Radio Phone to be of some use to the world. Therefore I will not allow it to be crushed entirely."

Then the whispers of the Great Antennius, God of Radio, filled the hearts of the Amateurs, who took heart, verily, and were strong as of yore. They did drag out their hereditary weapons, the Ancient Wouff-Hong, the Terrible Retty-Snitch and T.O.M.'s Kat, yea, it is even told to the prophet that some of the more bellicose gentry among the dwellers in the Land of the Eighth District even employed the lethal weapon known as the "forty-five." The battle was indeed terrible for doth not the Wouff-Hong smite grievously, and

biteth not the Retty-Snitch deep, and doth not the Kat of T.O.M. scratch most woefully? And many men fell on both sides and for a time the Amateurs did not prosper since they were few in number against the great host of the Amalekites arrayed against them.

Then again spake the Great Antennius, God of Radio, unto his Traffic Manager and said unto him, "Put thou it into the hearts of mine earthly agents, the Department of Commerce, to help these struggling Amateurs against this plague which I in my folly have laid upon them, by laws which shall wisely and justly control these broadcasting stations. Put thou it also into the hearts of the Amateurs that they must refrain from pounding upon their keys during the first watch of the night since it is evident that the listeners, it mattereth not how nutty, must also have their time."

And it was so. The earthly agents of

the Great Antennius did wisely and justly control the Broadcasting Stations and the Amateurs did stand by (and some even enjoy the concerts) during the first watch and then after most of the listeners were tucked in their beds, traffic flowed as usual during the rest of the night watches; although there still remained some misguided persons on both sides who stubbornly maintained that the ether belongeth entirely to them. But the Great and Terrible Wouff-Hong that squelcheth all things evil will surely squelch them in time—so wherefore worry? And as runneth the prophecy from NAA in the noontide watch—"The indications are for generally fair weather throughout the United States except for scattered thunder storms in some portions."

Mors omnia vincit—which meaneth in the language of the Ancient Men of Latium, "Long live Amateur Radio!"

Amplifier Operation from A.C. Supply

By P. D. Lowell*

For years we have been looking forward to the day when we could operate our tube equipment from the A.C. house-lighting supply. Early attempts in this direction were not very encouraging, the residual hum imposing a severe handicap on reception. Recently, however, considerable progress has been made towards a solution and it is safe to assume that the day of its perfection is not far removed. In this article, reprinted from the July issue of the Journal of the American Institute of Electrical Engineers with the kind permission of the Institute, Mr. Lowell describes the most recent progress in America in this direction.—Editor.

ELECTRON tube amplifiers now form an important part of practically all radio receiving sets, except the most simple types. Such amplifiers are in fact necessary to receive distant stations, or when using coil antennas. For good operation, amplifier tubes require for the filament a source of voltage of very constant value (usually about 6 volts) and for the plate a source of voltage of from 40 to perhaps 300 volts. The filament voltage is usually supplied by storage cells, and the plate voltage by dry cells. The maintenance of these cells in operating condition, especially the storage cells, is often a source of much difficulty and annoyance. The storage cells are necessarily bulky and heavy, require constant attention to maintain proper charge and density of electrolyte, give off injurious acid or other fumes, and are subject to considerable variations of voltage during the period of discharge. The development of an amplifier which can be supplied from the ordinary 110-volt, a-c. lighting mains is of considerable practical importance, since it would eliminate the practical difficulties of maintaining storage

cells. The amplifier using such a-c. supply has the important advantages of reliability, convenience, and cheapness both in first cost and operating cost.

Such an amplifier using five stages of amplification has been developed at the Bureau of Standards. There are three

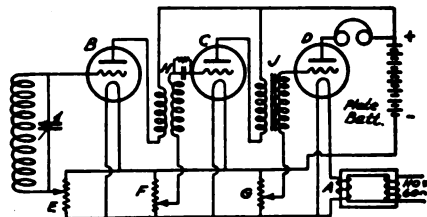


Fig. 1 Two-Stage Amplifier Circuit, using Tube Detector

stages of radio-frequency amplification and two stages of audio-frequency amplification. It is the purpose of this note to describe briefly this amplifier.

The first arrangement tried consisted of one radio-frequency stage of amplification, detector and one audio-frequency stage.

*Associate Physicist, Bureau of Standards.

The filaments of the three tubes were lighted by 6 volts supplied by a step-down transformer, the primary of which was connected to the 110-volt, 60-cycle power mains. The circuit is shown in Fig. 1.

In Fig. 1, the filament lighting transformer is shown at *A*, supplying voltage for the filaments of electron tubes *B*, *C* and *D*. The amplifier input circuit is connected to the grid of tube *B* and to the slider of the balancing resistance *E*, the latter having a resistance of 200 ohms and being connected across the filament line. A radio-frequency transformer is shown at *H*, a balancing resistance at *F*, an audio-frequency transformer at *J*, and another balancing resistance at *G*. The purpose of the balancing resistances *E*, *F*, *G*, is to keep the normal voltage of the grids at a steady value with respect to the average voltage of the electrical midpoint of the filament and thus to eliminate the hum which variations of the grid voltage would cause. These balancing resistances are adjusted until the hum is eliminated. Reception was accomplished with this circuit but there was considerable 60-cycle hum present in spite of the beneficial effect of the balancing resistances.

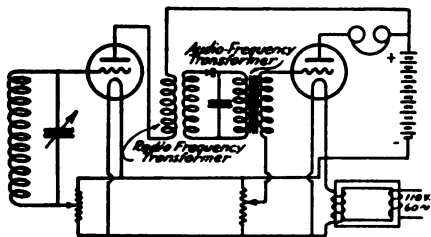


Fig. 2—Two-Stage Amplifier using Crystal Detector

The employment of a crystal detector in place of the electron tube detector reduced the 60-cycle hum very considerably. This circuit is shown in Fig. 2.

When an electron tube is used as the detector, there is impressed on both the plate and the filament a 60-cycle a-c. voltage which, although small, becomes very objectionable when amplified by one or two stages of audio-frequency amplification. When the crystal detector is used, no 60-cycle voltage is supplied to the detector circuit. The radio-frequency transformer whose output is delivered to the detector circuit prevents the passage in any appreciable amount of 60-cycle current supplied to the radio-frequency stage, and such voltages are not present in the crystal detector circuit and do not reach the input of the audio-frequency stage.

The employment of a crystal detector may at first seem objectionable, since with the crystal as ordinarily used it is rather difficult to find a point of good sensitivity.

But tests on this amplifier showed that careful adjustment of the crystal detector was not necessary because the radio-frequency amplification preceding the detector usually gave sufficient signal strength so that a point of sufficient sensitivity could be easily found.

This circuit gave quite good results. The 60-cycle hum was practically eliminated and the crystal detector gave almost as good rectification as the tube detector.

It was found that better amplifying

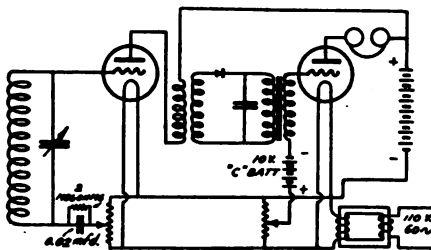


Fig. 3 Two-Stage Amplifier using Crystal Detector, with grid condenser for radio stages and grid battery for audio stages.

action could be obtained by inserting condensers of about 0.02 microfarad capacity, shunted by 2-megohm grid leak resistances, in the grid circuits, in series with the sliders of the balancing resistances. The grid condensers and grid leak resistances allow the grids to assume a normal voltage which is more favorable for amplifying purposes. The leak resistances allow any accumulated charge on the grids to leak off to the filaments. Still better amplification and quieter operation was produced by replacing the series grid condenser and leak in the audio stage with a 10 volt battery giving a negative charge to the grid. A battery of dry cells was used for this purpose; since only an extremely small current is required, the life of the dry cells is practically their shelf life. This gave a circuit as shown in Fig. 3.

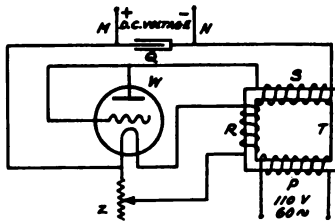


Fig. 4 Rectification Circuit for Plate Voltage Supply.

Alternating current rectified by means of a gas-filled two-element rectifier tube (a "Tungar" tube) was tried as a source of filament power but the residual hum was much greater than when unrectified alter-

nating current was used. This is because of the fact that during rectification, the wave form becomes distorted and it becomes impossible to stabilize the grid voltage by means of the balancing resistances.

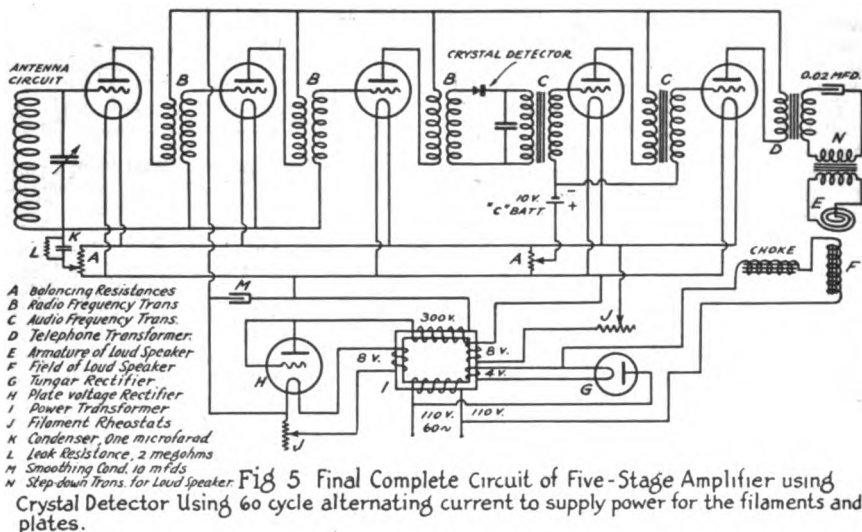
In the above mentioned tests, a plate battery was used for convenience, but this was replaced by alternating current which had been rectified by means of an electron tube and smoothed out with condensers of large capacity. The rectification circuit for the plate voltage supply is shown in Fig. 4.

In Fig. 4 the primary *P* of the transformer *T* is connected to the power mains, and winding *R* gives 8 volts for the filament of the rectifier tube *W*. Winding *S* gives 300 volts which is rectified by the tube *W*

The final circuit is shown in Fig. 5, and includes three stages of radio-frequency amplification, galena crystal detector, two stages of audio-frequency amplification, loud-speaking reproducer, and the necessary power transformer and rectifying circuits.

This final circuit gives good amplification, with a slight residual hum which is not great enough to be objectionable when receiving signals of ordinary readable strength. The residual hum is of course more objectionable when extremely weak signals are being received. Radio telephone music and conversation are clearly reproduced.

The amplifier was operated under normal conditions using the usual sources of direct-



and smoothed out by the condenser *Q*, which has about 10 microfarads capacity. This gives at terminals *M* and *N* a high-voltage direct current which is quite suitable for use on the plates of the amplifier tubes. Rheostat *Z* varies the brilliancy of the filament of the rectifier tube and, simultaneously, the voltage for the plates.

The use of a loud-speaking telephone receiver such as the "Magnavox" was made possible by applying to the field coil of the loud speaker an alternating current rectified by a "Tungar" rectifier tube. The impedance of the field coil was sufficient to smooth out the pulsating current to such an extent that the hum was not annoying. It was also advantageous to couple the loud-speaking reproducer circuit to the plate circuit of the last amplifier tube by means of a one-to-one ratio telephone transformer with a 0.02-microfarad condenser in series with the telephone circuit. This helped considerably to reduce the residual hum in the telephones.

current supply, and then switched over to alternating-current supply. This comparative test showed the a-c. supply to give as good amplification as the d-c. supply.

For the reception of damped waves, the amplifier as constructed operated most satisfactorily for frequencies from 400 kilocycles to 1500 kilocycles per second (750 to 200 meters). This frequency range was determined by the working range of the radio-frequency transformers used. By using suitable radio-frequency transformers, it is expected that the amplifier will be effective for the reception of damped waves for frequencies as low as 30 kilocycles (10,000 meters). This amplifier has also been found effective for the reception of undamped waves, when used with a separate heterodyne.

The special transformer with five windings and the rectifier tube were assembled in one box, and the amplifier tubes and amplifier transformers and other apparatus were assembled in a separate box. This

was done to avoid having the amplifier immediately adjacent to the special transformer, from which it would pick up considerable 60-cycle hum. The assembled rectifier unit measured about 8 in. by 8 in. by 9 in. and weighed about 21 pounds. The assembled amplifier unit measured

about 8 in. by 11 in. by 14 in. and weighed about 21 pounds.

Mr. F. W. Dunmore was a co-worker and participated in the development of this instrument. The author wishes to acknowledge his indebtedness to Mr. R. S. Ould for helpful suggestions in preparing this paper.

A Week in Baltimore With Portable Station 3OI

By John Evans, jr., 3AQQ

AT the June meeting of the Chester County Radio Association, Yours Truly was resting easy after making a report that the association had at the present time over 125 members and was growing. Then out of a clear sky the meeting was informed that 3OI was to go to Baltimore for the week of June 10-15th inclusive, to be placed in the Fifth Regiment Armory under the auspices of the Maryland Radio Association for participation in the Export and Import Exposition to be held there on those dates.

Several days later a phone message from headquarters took me to Parkesburg and after two weeks of work which included painting, scrubbing, wiring, testing, etc., portable station 3OI hit the roads for Baltimore, at 10:10 A.M. Saturday, July 8th. Four miles of dusty road put a coat of tan on the sturdy shack. Everything went well until Nottingham, Pa., was slightly in the distance, then the engine on the truck refused to percolate. We found the gasoline feed to the carburetor broken completely off. The sun was shining brightly and, take it or leave it, it was some walk up the pike to the nearest garage. After three precious hours of tinkering we started off again.

It might be well to mention right here that the truck from the ground to the top of the shack measures 13 feet 6 inches, which necessitated careful watch on limbs of trees and other things overhead. At Gilpin Falls, Md., we encountered a covered bridge, which took off a piece of our roof. Everything went fairly well but of course slowly until we landed in Baltimore about 12:30 A.M. Sunday.

Our directions were anything but specific and after traveling up and down Charles and Gay Streets several times, we found a haven in the Central Police Station, where a pay-telephone was our only hope. After making a dozen calls I found it was impossible to get the truck into the Armory that night. Then after making a round of the city and looking over fifteen or more garages we finally found one to accommodate her height and parked her for the night. The driver and I then found a hotel and hit the hay for a much needed rest.

In the morning on going to the Armory we were cordially met by the Third District Council President, Mr. E. R. Bateman, who was so anxious to see 3OI again and get her in the booth that we had to go to the garage at once and bring her around to the Armory. More hard luck awaited us. We found that the clearance of the Armory door was not sufficient for her to get in. Since a cottage on wheels will not shrink as easily as a radio man's pocketbook, it was necessary for us to get riggers to remove the house from the chassis and put it in position on the Armory floor. This feat took practically all day Sunday.

On Monday morning I took up the task of putting the batteries and other paraphernalia together, also had the house cleaned inside and outside. Monday seemed to speed along and when the Exposition opened at 7:00 P.M. everything was in readiness and the crowd eagerly awaited the first selection from our radiophone transmitter.

I will state here that the Hall was well supplied with radio receiving apparatus. All of the stations excepting one were equipped with Magnavox reproducing devices, and the other one had a real Western Electric loud speaker that barked a message that was echoed and re-echoed throughout the Armory.

The transmitting equipment in 3OI includes a 20-watt DeForest transmitter which is used for key work and a special two 5-watt tube radiophone transmitter (3ZO-built) employing the Appleby-Heising modulating scheme. This set was driven by either 420 volts storage battery or a 500 volt motor generator, and was the set which was used practically all of the time we were in Baltimore.

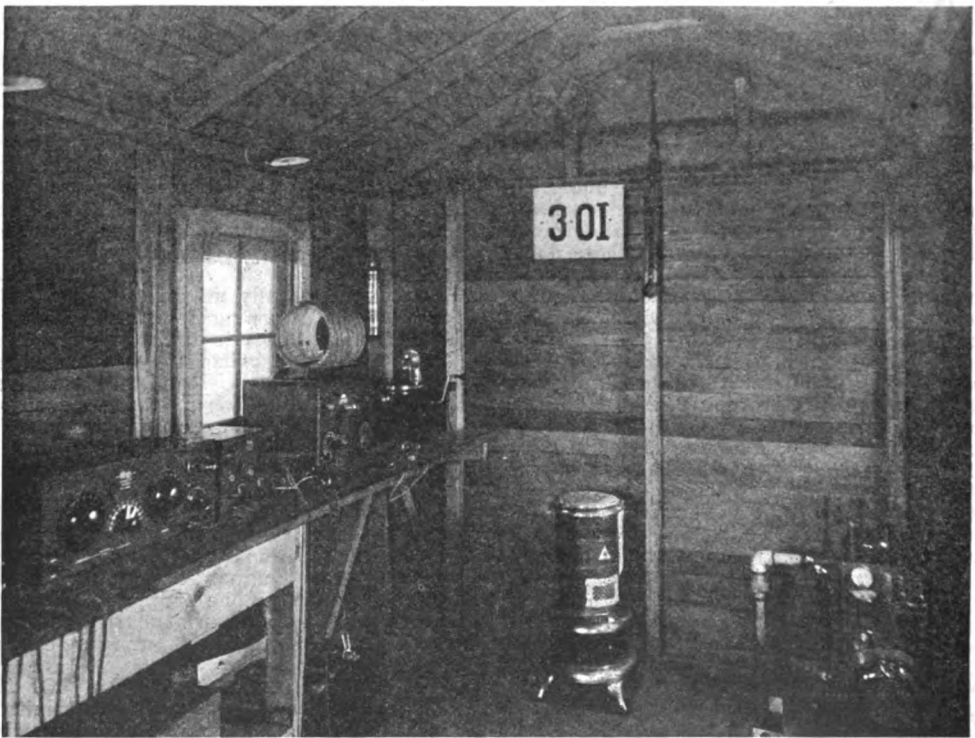
The interest of the crowd seemed to center about 3OI—no doubt because it is something the public rarely sees—a radio broadcasting station in full operation; also because of the careful designing of the apparatus and the well-arranged interior of the station. In order to estimate the number of visitors who came into the station, on Friday night we asked them to sign their names in a book. This book is now in

possession of 320 and contains the names of 485 persons. It is easily estimated that a like number came in who did not sign, and by using the Bertillon system we figure that approximately 1500 people looked thru the windows. We couldn't stop to count the finger prints. Taking it all in all a conservative estimate for the week's attendance at 301 is between 5000 and 6000 persons. In fact the promoter of the exposition gave us quite a boost when he stated that never in his thirty years of experience along this line had he seen an exhibit attract as many people as did 301.

The following special features were broadcasted from the station: On Tuesday

Intermingled with these features, many of the latest Victrola records were broadcasted.

During the week, at about supper hour, I listened to many of the amateurs around Baltimore communicating by CW telegraph. Three of these, 3FE, 3APT and 3XAA, were worked. Many reports came to our booth that our concerts were being received with a great deal of pleasure in Baltimore proper. Many of the Baltimore skeptics stated it would be impossible for the concerts to be heard in the city, as the Fifth Regiment Armory is nothing more than a large metallic screen. The supports for its large cylindrical roof are steel



Mobile Station 301 from the entrance

night, Mr. H. A. Beale, Jr., of Parkesburg, Pa., gave a very interesting lecture on "Radio Development." On Thursday night, Mayor Broening of Baltimore pleased the crowd with an exceptionally splendid address on "Baltimore." On Saturday, the Mexican Consul addressed the crowd assembled around the loud speakers. Every afternoon and evening, the audience was held spellbound by strains from a harmonica played by the champion harmonica player of the world, Mr. William H. Burke. Selections on the harmonica were given also by Mr. Alonzo Parks, a brilliant player.

I-beams and the roof itself is of tin. But we got along very well, no hitches or delays being incurred.

On Sunday morning, we were at the Armory about 7:30, ready to load the cabin on the truck and light out for home, but only to find that no one can work in Baltimore on Sunday without a permit and ever since I have been wondering how all these radio fans get their apparatus built. Anyway, Mr. Bateman and myself went downtown to the General Police Inspector and got a special permit. At 3:45 P.M. we were on our way home. With the exception of

a lost fan belt and being stopped by a motorcycle officer who asked where our mirror was, the trip was uneventful and we arrived in Parkesburg at 1:00 A.M. Monday.

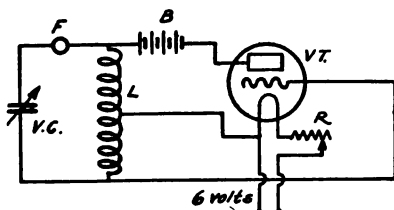
I wish to express my deep gratefulness to Messrs. E. R. Bateman, Émile Boucher, Winters Jones and Hughie Jones, for the great favors and assistance they rendered me during my stay in Baltimore.

A Calibrated External Heterodyne and Wave Meter

By Alpha A. Learned, 1AAU

CONTINUOUS wave signals are usually received by allowing the detector tube to oscillate at a frequency nearly the same as that of the incoming signal, thus producing beats of an audible frequency which are rectified by the detector tube. The production of beats, called heterodyning, can be accomplished by using a non-oscillating detector bulb or a crystal, and having a separate oscillating bulb to act as the heterodyne. When the external heterodyne is used with an ordinary three-circuit regenerative set, neither increased sensitivity nor ease of adjustment is gained, altho the device is valuable as a wave-meter for all incoming C.W. signals. However, with a radio frequency amplifier set using iron core transformers the ease of adjustment obtained with the external heterodyne is amazing—as practically all

The flashlamp bulb is used as a resonance indicator when calibrating the instrument and also when measuring the wave length of any transmitting set. (Its presence has no effect on the operation as a heterodyne.) A standard wave-meter and a C.W. transmitting set are required for calibration. Connect a flashlamp bulb in series with the coil of the standard wave-meter and measure the wave length of the transmitting set. Then place the heterodyne near the transmitting helix and turn the variable condenser until the flashlamp lights, marking the resonance point and the wave length on the unengraved portion of the dial. This same thing should be done at intervals of ten meters, until the entire wave length range is covered. A "Somerville" dial is recommended, as the wave lengths can be carefully marked upon it in ink with a neat appearance. The variable condenser should be of a high grade with no loose bearings and a "Karlows" or other type of vernier movement should be attached. A detector bulb will often work as well as an amplifier, and with some tubes the B battery can be as low as two or three volts. A filament switch on the panel is convenient for a rapid change from C.W. to spark reception.



V.C.—Variable Cond max. capacity 0.00025 mfd.

L—10 turns No. 20 wire on $\frac{3}{4}$ " diameter tube, with tap in the center.

B—Small $22\frac{1}{2}$ volt "B" battery.

V.T.—Amplifier tube.

R—Rheostat.

F—Flashlamp bulb.

the amateur C.W. signals can be heard on a single adjustment of the receiving tuner, only the heterodyne dial being turned to pick out the desired signal.

The figure shows a diagram of connections and gives specifications for an external heterodyne having a wave length range of 130 to 400 meters. As can be seen, it is nothing but a miniature transmitting set. The variable condenser dial, rheostat knob, flashlamp bulb and two binding posts for the filament battery can be mounted on a panel about 9 inches long by 6 inches high with the V.T., inductance and B battery in the rear.

The position of the instrument is not important, as generally any place within two or three feet of the receiving set is OK.

The writer constructed one of these devices about a year ago, and through constant use in DX reception with a radio frequency amplifier set it has proven itself indispensable.

High-Power Vacuum Tubes

THE development of vacuum tubes of high power has now reached the point where even such devices as the Alexanderson alternator have a serious competitor. The research laboratory of the General Electric Co. has produced a tube capable of developing 20 kilowatts, as the result of some years of development work by W. C. White and H. J. Nolte, and in England the Mullard company is said to

(Concluded on page 39)



A Pioneer In High-Powered Stations— “SA” in 1904 By “An Old Timer”

IN December, 1903, while Electrical Engineer at the U. S. Naval Station at San Juan, Puerto Rico, Rear Admiral A. Dunlap instructed me to install a 3KW. Slaby-Arco set near the city of San Juan, on a high bluff overlooking the sea, to operate with a similar station of the Navy's at Culebra, an island near the eastern end of Puerto Rico, and ships at sea. We got busy with the old tape and coherer set, and felt as if we were on top of the world when we got the station going—the first installation on the island.

Then about February, 1904, I was handed an order reading “Locate a high power wireless station in the island of Puerto Rico”, and was told not to come back until I had found a good place. We made arrangements so the station work would go on, and started out to locate the “monster station” of those days. This was to be a 35KW. DeForest outfit, to communicate with similar stations at Guantanamo, Key West, Colon, and perhaps with New York direct. About a mile from the small radio station was an old Spanish fortification with a moat, located on the famous Spanish military road from San Juan to Ponce. The moat was perpetually damp and appealed to me as a good ground, and after surveying the location it met with the Admiral's approval and work commenced. It was a grand sight to see the 210 foot towers being erected, and the street was crowded with people watching the work. The towers were 300 feet apart in a triangle, with the operating house in the center. We made arrangements with the local lighting company to supply 110-volt 60-cycle power, and got busy setting up the apparatus. The antenna was in three fans of 15 wires each, 300 feet long, one fan being used with a loop connection for receiving, and the other two running to an anchor gap, leads from which went to the helix and a three-foot switch hung on the wall. We made this switch to protect the receiving set. Leads from this set ran to the regular DeForest change-over switch and then to the receiving set, which was the old three-slide tuner, electrolytic responder, with head phones. This was all new to us, as we had been using only the coherer. Later DeForest installed a pancake tuner with five coils, which was an improvement. The transmitter consisted of a 35KW. transformer; chokes, a condenser formed by three earthen vats about six by three by two feet containing glass plates and lead foil immersed in oil; a

straight spark gap in a wood box about three feet square, fitted with radiating discs, a hand adjusting wheel, and a small blower; a solenoid-operated relay key operating under oil; and the tuning helix, which was about five feet high, made of half-inch copper tubing.

When we first started up the lighting company had so much trouble from surges that they cut off, so the Navy had to build a power plant of their own. There was another delay, but by November, 1904, we were running. In October, 1905, a DeForest man arrived to start the testing and by December the plant was in good condition. If I recall aright, the call letters were:

San Juan—SA
Guantanamo—SI
Colon—SL
Key West—RD

and these four stations were the first high powered long distance stations of the U. S. Navy.

Then the fun began. Each station had a regular schedule. We would send D's for half an hour, then SI would, then SL, then RD. Sometimes we would hear each other, but more often it would be static, and before we got communication established we broke all the ten commandments with a few radio commandments added. We often got DF, the old DeForest station at Manhattan Beach, near New York, and one night were surprised to hear a high-pitched note signing BO, which kept us all guessing until we learned it was the Fessenden station at Brant Rock, Mass.

No doubt many of the old-time men will be glad to see the accompanying photos of this station. Here's luck to old SA, now NAU.

HIGH-POWERED VACUUM TUBES

(Concluded from page 37)

have successfully operated a 75-kilowatt tube made of quartz.

The G. E. tube is of very modest dimensions for its power, apparently being only some 20 inches in length by 3 inches diameter. It has a large and very rugged filament many times the diameter and length of ordinary power tubes, a cylindrical grid surrounding the filament, and a cylindrical anode about 1½ inches diameter by 8 inches long. Instead of supporting the anode within the tube as one of the customary electrodes, it is itself sealed into one end of the 3-inch glass tube, thru the other end of which the grid

and filament leads enter. Thus the plate forms a part of the outside wall of the tube, and it is accordingly easy to water-cool it for the safe carrying of large amounts of energy. Ten such tubes may be operated in parallel, generating 200 kilowatts of h.f. energy, which is ample for trans-atlantic telegraphy. They are ordinarily operated on about 20,000 volts D. C., obtained by stepping up A.C., rectifying by kenotrons, and filtering.



Tests looking towards the use of these high-powered tubes in commercial trans-ocean work are already under way at Radio Central, WQK. At present only the carrier wave is being radiated, while detailed antenna measurements are being made in the collection of data in this new work. It seems still to be quite a trick to parallel a group of these big tubes and secure high efficiency.

It is commonly believed that outfits of this kind will displace the complicated and more expensive alternators and results already obtained indicate that single valves of outputs as high as a thousand kilowatts are by no means impossible. *K.B.W.*

Death of James L. Autry

WITH heavy heart it is our painful duty to record the passing from this life of James L. Autry, pre-war 5ED and post-war 5AB-5ZX, at Houston, Tex., on August 31st.

Jimmie Autry was a peach in every respect and dearly beloved by a multitude of friends. He was a real old-timer in amateur radio, having been the very first A.R.R.L. member in Houston, a pre-war District Supt. of Texas, and founder of the

Houston Radio Club. Altho not very active as an amateur the past two years, Houston amateurs still considered him one of them at all times. He was in bed at the time of the last local ham-fest but got up long enough to come down and see the banquet table and meet the out-of-town hams.

Altho but 23 years of age he had risen to heights in the business world, being vice-president of the American Petroleum Co. and a director in the Fidelity Trust Co. of Houston.

In his school life he had been equally prominent, having graduated with honors from Rice Institute, Houston. For two years he managed the student newspaper, *The Thresher*; served as a member of the honor council in 1919-20 and as chairman of the council 1919-21, a member of the student's council for the same period, and was a member of the Congressional Club and of the Engineering Society.

Because of a most lovable personality and splendid character, Jimmy Autry had the admiration of friends uncounted. He was a member of that Mississippi Valley gang comprising pre-war stations 9IK, 9LQ, 9EP, 9NN, 9JT, 5BV and 5ED, who before the war made green ink famous in amateur correspondence. It is hard to think that old 5ED is no more.

Houston papers state that Autry was a member of the Ku Klux Klan and received the honor of their burial service, which has been established as the most beautiful service ever held at a grave in Houston.

Tube Supply from A.C.

WE seem slowly but surely progressing towards the ability to operate the filaments and anodes of our receiving audions from the alternating current house mains without trouble from 60-cycle gurgles. The French have experimented in this direction for many years and a recent issue of "L'Onde Electrique" described an interesting amateur installation of M. Ritz which is giving good account of itself.

The hook-up is shown in our diagram, where one tube, R, acts as a rectifier to supply the detector, D, which is connected to the aerial with the customary three-coil circuit in which P, S, and T are the primary, secondary and tickler, respectively. X is a transformer with three secondaries, one of 4 volts for the rectifier filament, one of 110 volts for the plate supply, and another of 4 volts with a center tap for the detector filament. Valve R rectifies the 110 volts and stores the energy in condenser C, which is of 4 mfd. The objectional feature encountered in all systems of supply from A.C. sources is the residual hum and to best neutralize this a filter arrangement should

(Concluded on page 59)

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Girding Up Our Loins

WE hope we're not going to have to scrap to retain a place in the ether for amateur operation. The outlook for peace gets gloomy every once in a while but we still hope that things will run smoothly this winter.

This is the third time we've had a heart-to-heart on this subject. We amateurs must not let ourselves be crowded out of existence by a horde of listeners-in. Our important work must not cease completely because there are broadcasts. There's not the slightest doubt that we must share the air but "sharing" means part for each of us. On the reaction we've got afraid to transmit—afraid some influential voice will call us on the telephone and complain. Say! Things are coming to a pretty pass. We're *expected* to transmit. Our government licenses us for that purpose and feels that it is worth while because it means progress to the art and an army of skilled operators in time of national emergency. Do you realize that because an uninformed public has thoughtlessly protested and because we've been anxious to play fair, we're *slipping*? If we don't get on the air soon and stay there with determination we are liable to find the novice listeners completely in possession of the air and resenting a single peep out of us. Let us not wait until it is too late.

Certainly novices complain against amateur transmission. They don't know any better. They think the air ought to be quiet for them all night long. They don't know that QRM is the rule rather than the exception in radio. The whole matter is summed up in three words—"They don't know."

But must we therefore *quit*? We'll answer: We must *share* but we must not quit. Again we counsel a local understanding—an agreement between all classes of radio enthusiasts in each community—with a specified division time such as 10 P.M., before which the air shall be quiet for listening and after which U. S. Licensed Amateur Transmitting Stations shall G.A. Something of this sort is very desirable in correcting the impression that it is a crime to operate a transmitter. A.R.R.L. members are again urged to deal

with utmost kindness and patience with newcomers in the game, to endeavor to make them see the light, to go out of their way to favor them, to give them the benefit of every doubt, to observe all the courtesies of the ether, to QRX as one amateur to another, and to play the game thruout as an A.R.R.L. thoroughbred should—but flatly to decline to shut up shop completely in their favor. When there are complaints tell the listeners in a nice way that you have already given them the biggest share of the evening and that now you have some work of your own to do and want to use some of the air yourself.

Be more than reasonable, but be firm. We're going to have lots to do this winter.

K.B.W.

Sectional Organs

HAVE you an amateur magazine published by your radio club, executive council, district or division? If you haven't you don't know what you are missing. If you have, what are you doing to help it along? Do you know that an editor of an amateur publication has one of the hardest jobs in the radio world and that most editors complain that they either have to write most of the stuff themselves or continually wallop someone over the head for an article? Let's see if it is really worth while.

In the first place, most local or sectional papers start as the organ of the executive council or radio club and perhaps are but a few mimeographed sheets stapled together. They tell of the meetings of the club or clubs in the vicinity, what they are doing, what happened at the last meeting and what is going to happen at the next, and possibly the details of a contest of some sort or membership drive. This goes a long way in holding the clubs together but an even greater service to amateur radio can be rendered by making known and helping to enforce the periods of listening, local work, and DX; propounding the true A.R.R.L. standards and ideals; and furnishing a vehicle for the expression of sentiment and opinion for amateurs in that section of the country. In some places these publications print parts of the reports of their Division Manager showing where prog-

ress is being made and where stations or appointments are needed and in several cases inestimable service has been rendered to the League by publishing late bulletins or schedules of special tests and relays. Then, too, some of the best papers presented at club meetings can be reprinted, thus reaching a greater number of persons and forming a handy reference for those who heard the lecture but could not carry away all the data presented. The dealers in the vicinity are glad to advertise in the publication when it is shown that it is a true amateur publication and backed by the "hams," so this will contribute to the financial support as will a department of classified advertisements. The above are a few of the ways in which a "sectional organ" can serve the amateurs in its community—from which it appears it has a definite place in local affairs.

All this is very well and good as long as it remains an *amateur* publication but just as soon as the editor and a few more see the possibility of making some money, *watch out!* The fellows that control the publication *must* be amateurs and *must* be directly responsible to the amateur gang by virtue of having been elected by members of their local club or clubs or by general election in the section of the country served by the publication, as with *QST*. When those directly in charge of the magazine think they can break away from the gang to put money in their own pockets, and that surely the rest will be willing to pay five or ten cents more for each issue and that the amateurs will still give their whole-hearted support and donate contributions just the same, they have made one of the biggest mistakes of their lives. The first thing that follows such a procedure is the decreasing of amateur interest and the increasing of subscription and advertising rates to bring in more money in the get-rich-quick scheme. If such a magazine does not perish it changes policy and soon becomes known as a broadcaster's magazine, in which crowded field it may thrive during the peak of the craze, but passes beyond our notice. We see such magazines displayed among others on the news stand in front of our office building and perhaps pause to wonder what the amateurs in the locality where it is published think of it and then passing on up to our office we find the answer in the morning's mail. One of these letters we published in June *QST*.

Nope, we believe that to make a go of a club publication the time must be donated by the staff and if it expands to take in some of the surrounding country it will mean more hard-working amateurs on the staff. To such a gang we extend the right hand of fellowship and wish them luck and hope they may unearth some latent local talent. We greatly enjoy reading copies

of their efforts that drift in to this office. We fear no competition for we feel they are really a part of us. Just as there is a need for city councils or legislatures and a Congress, so also is there a need for local or sectional publications and *QST*. If such editors wish permission to reprint extracts or whole articles from *QST* all they need do is write us, and if we should wish at some time to reprint an article we liked we would expect the same courtesy, always, of course, giving credit to the source.

But what we started to say was, these editors need help and if *you* can be of service to them *do so*, for you are giving amateur radio a lift.

B.P.

Why Not G.M.T.?

WHENEVER in the past our A.R.R.L. has conducted a relay or test of national interest to radio amateurs, Eastern Standard Time has been used. Why shouldn't we adopt Greenwich Mean Time as the standard in all our relays and even in our everyday practice of traffic handling? Why shouldn't we have one standard of time by which we all may be governed alike and a time which we can adopt officially in our radio work?

Such a system would simplify matters considerably and there wouldn't be that doubt of accuracy which enters your mind if you live out in Wyoming and come to the point of converting Eastern Standard Time to Mountain Daylight Saving Time. All that would be eliminated because it only would be necessary to make one adjustment in your mind which would hold true for every part of the country.

More important is the adoption of a standard time of international recognition as we approach international amateur radio communication with European amateurs. Greenwich Mean Time is known the world over and is the one standard of time recognized by every civilized country.

G.M.T. divides the 360 degrees of the rotation of the earth into twenty-four periods (hours) of fifteen degrees longitude each. Starting at Greenwich, England, which is reckoned as 0 degrees and moving westward, for every 15 degrees of longitude the time is reckoned as one hour west of Greenwich. Thirty degrees is 2 hours west; 45 degrees, 3 hours west; and so on through the 360 degrees of longitude.

The matter of converting your local standard time to Greenwich Mean Time is a simple process if you will bear in mind the difference in time between the two. Eastern Standard Time is five hours earlier than Greenwich Mean Time. When it is 12:00 noon in Washington, D. C., or any other place having 75th Meridian Time, it is 1700 G.M.T. Thus it will be seen that 1700

G.M.T. is 11:00 A.M. Central Standard Time, 10:00 A.M. Mountain Standard Time, and 9:00 A.M. Pacific Standard Time.

G.M.T. uses the complete 24 hours of the day without regard for A.M. or P.M. While it is rather difficult to purchase a clock with a 24-hour face, it would be well to take a spare clock and set it for G.M.T. and use it in recording all radio communications. With our ordinary clocks we would read time direct until 12:00 noon, but since G.M.T. makes no distinction between A.M. and P.M. the hours after twelve noon would be added to twelve to give correct G.M.T. Three o'clock morning would be written 0300 and three o'clock afternoon would be written 1500.

In keeping a log G.M.T. would be invaluable for at least one good reason. Suppose you heard a signal from a great distance and suppose the transmitting station wished an absolute verification of the record. Just see what a simple matter it would be to compare the logs of two or three dozen stations all keeping the same standard of time. It would make no difference if the recording stations were located all over the face of the earth—the time would be the same. No effort would be wasted in converting the time of a given meridian to that of another; the only factor that would have to be kept straight would be the date, which we all do now.

How many times has it happened that you receive a card from a distant Second District station informing you that your signals were heard October 4th, 3:19 A.M.? What does it mean to you? Not a thing unless you know that 3:19 A.M. means 3:19 A.M. E.S.T. or 3:19 Eastern Daylight Saving Time. Even then there is confusion sometimes because a number of operators forget that a new day begins at midnight. As a matter of fact you may not have been operating at 3:19 A.M. on October 4th, but perhaps you were operating at 3:19 A.M. on October 5th, and of course you write to the operator from whom you received the card and learn that he meant 3:19 A.M. E.S.T., October 5th. All that would be done away with. There would be no A.M. or P.M. or E.S.T. or Central Daylight Saving Time to confuse you. There would be one standard of time by which we all would be governed and keep our records accordingly.

It looks pretty good for our use, doesn't it?

F.H.S.

Thanks

NOBLE has been the response to our plea "Your Pen in Hand." We knew the stuff was there. The numerous valuable responses will do much to make our QST a better magazine for us all. We extend our hearty thanks to the fellows who are helping us.

This shows all the clearer that there is a world of good dope available. How about the rest of you? No doubt you read QST and we hope you get helpful suggestions from it. Do you realize that this magazine is co-operative and that you find valuable things in it because some other amateur wrote us about something he knew about? Are you doing your share as an A.R.R.L. member? Say, what do you know that's new and interesting?

And you chaps who've promised to write articles for us—we want to tell you about a fellow who died not so long ago. When he appeared before Saint Peter the good saint asked him what good he'd ever done on earth, and he replied "Oh, I was a good A.R.R.L. member and wrote articles for QST."

St. Peter beamed. "Step right into the elevator, please."

The good A.R.R.L. man smiled broadly, stepped into the elevator, and as the door clicked behind him asked:

"How soon does she go up, Pete?"

St. Peter smiled grimly.

"It doesn't go up—it goes down. You only promised to write those articles for QST!"

Is it necessary for us to say anything more?

Thanks.

K.B.W.

What Would You Do Without QST?

THE heading on this editorial suggests an awful state of affairs, doesn't it?

What would you and all the rest of our A.R.R.L. and the telegraphing amateur fraternity do if there wasn't any QST? We hate to think of it.

Did it ever occur to you, O.M., that you are directly and vitally concerned in keeping QST alive and coming to you regularly each month? It costs a great big piece of jack every month to get QST into your hands, so much that your yearly dues are not even a drop in the bucket. And we haven't any "angel" to back us up with coin. No, QST like every other magazine is dependent on its advertising. We have the interest of our readers always before us and do our very best to print only advertising that is worthy of your patronage. And that patronage, the thing which makes QST possible must be supplied by you!

You can find everything in reputable radio apparatus "from soup to nuts" in QST. Make QST your exclusive buying guide, get good stuff, and keep your magazine alive.

And don't forget, O.M., to mention QST when you write to advertisers. It tells them that you are an amateur of good judgment and that QST is worthy of their support as well.

E.C.A.

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



NOT many months ago the Roanoke Division, comprising the states of North Carolina, Virginia, and West Virginia, was barely holding its own with some of the larger divisions in traffic handling. Today it's a different story and by continued hard work in organization, W. T. Gravely, Manager of this division, with the cooperation of every man under his supervision, has given the larger divisions something to think about. When a division the size of the Roanoke can turn in a traffic report of 1615 messages for

month. Every man is bubbling over with enthusiasm and is eager to make his division the best in the country.

We suggest to those of you who are having trouble getting your reports in on time, get in touch with 3BZ and get his method of operation. It's a winner.

The A.R.R.L. is proud of every man in the Roanoke Division. We congratulate you all.

C. J. Dow, of 6ZAC fame, has been appointed temporary manager of the Hawaiian Division.

Message Traffic Report By Divisions AUGUST

Division	Stns.	C.W. Msgs.	M.P.S.	Stns.	SPARK Msgs.	M.P.S.	Stns.	TOTAL Msgs.	M.P.S.
Atlantic	27	844	31	7	499	71	34	1343	40
Central	27	1101	41	23	1418	62	50	2519	50
Dakota	7	257	37	3	16	5	10	273	27
Delta	3	58	19	2	21	11	5	79	16
East Gulf	11	256	23	3	56	18	14	312	22
Midwest	11	469	43	2	24	12	13	493	33
New England	25	1216	49	3	106	35	28	1322	47
Northwestern	3	51	17	9	216	24	12	267	22
Ontario	4	50	12	0	0	0	4	50	12
Pacific	19	323	17	20	822	41	39	1145	36
Roanoke	33	1510	46	2	105	53	35	1615	46
Rocky Mtn.	2	30	15	2	5	3	4	35	9
Vancouver	3	19	6	5	101	20	8	120	15
West Gulf	11	220	20	15	433	28	26	653	25
Winnipeg	0	0	0	1	2	2	1	2	2
Total,	186	6404	34	97	3824	40	283	10228	36
C.W. Messages, 6404—63%									
Spark Messages, 3824—37%									
Total,	10228								

the month of August—there's a reason. That reason is organization and cooperation. Even during the best winter months Roanoke stations did well to roll up a total of four or five hundred messages.

Several months ago it appeared as though broadcasting was going to put a crimp in amateur traffic. Did those amateurs throw up the sponge and quit? They did not. They went right out and took the broadcast listeners into their clubs and converted a great number of them into telegraphers and A.R.R.L. men. Several of them even handled messages and reported them this

L. A. Benson, because of business pressure, had to resign and in his place we have George S. Turner, 9ZAD of Independence, Mo., as the manager of the Midwest Division, elected by a popular vote of the members thereof.

Individual traffic honors for the month again go to a spark:

** F. B. Ostman, 20M **
** Ridgewood, N. J. **
** Atlantic Division **
** 408 messages **

TRAFFIC REPORT

Roanoke Division—C.W.: 4BX, 166; 3MK, 142; 3BLF, 132; 4MW, 129; 8AMD, 101; 4GH, 93; 3IW, 70; 8AFD, 70; 3TJ, 60; 4DC, 53; 4LP, 50; 8SP, 49; 3BMN, 46; 4GX, 35; 3ZZ, 34; 8BDB, 35; 4KC, 32; 3BVC, 28; 3BVL, 25; 8BKE, 24; 4ID, 22; 3BIJ, 20; 4NT, 18; 3BZ, 16; 3CA, 12; 3ATZ, 10; 8BPU, 9; 8AQV, 7; 3MO, 6; 3AUU, 7; 4NV, 4; 8CAY, 3; 3AEV, 2; total 1510. Spark: 8BDA, 53; 4IE, 52; total 105.

Atlantic Division—C.W.: 3ZO, 109; 2BNZ, 80; 2ALY, 74; 2AFP, 67; 8ACF, 52; 3DT, 45; 8AIO, 41; 8BIL, 40; 3FS, 33; 8CKM, 32; 2BDG, 30; 2CDR, 28; 3WF, 27; 8CON, 26; 2BG, 26; 2BEM, 24; 8AOL, 21; 3ANJ, 20; 8BTR, 15; 2AJA, 8; 8ARI, 8; 3AWH, 6; 8ZC, 5; 3EM, 5; 8AKW, 5; 8OW, 7; 2RZ, 1; total 844. Spark: 2OM, 408; 2BQZ, 26; 3FP, 22; 2ARB, 16; 8VE, 18; 3CS, 6; 3BTP, 3; total 499.

Dakota Division—C.W.: 9DR, 75; 9AUA, 67; 9APW, 34; 9AVZ, 33; 9BAF, 33; 9BAV, 10; 9EA, 5; total 257. Spark: 9AYW, 4; 9ZC, 8; total 16.

Rocky Mountain Division—7LU, 21; 7ZO, 9; total 30. Spark: 7ZV, 3; 7DH, 2; total 5.

Pacific Division—C.W.: 6BQC, 52; 6KA, 45; 6FH, 35; 6CU, 35; 6PI, 28; 6FT, 20; 6EN, 19; 6ALU, 16; 6BJC, 15; 6ZX, 11; 6JD, 10; 6BF, 8; 6ASP, 8; 6ZB, 6; 6BRT, 6; 6EC, 5; 6AQA, 2; 6AGH, 2; 6KY, 2; total 323. Spark: 6GR, 157; 6HP, 102; 6UP, 83; 6HC, 72; 6OD, 64; 6OL, 48; 6ASC, 43; 6FH, 32; 6ABW, 32; 6KE, 25; 6ALD, 24; 6AJH, 29; 6GT, 22; 6ANX, 16; 6IV, 14; 6ABX, 15; 6AVR, 13; 6ZB, 12; 6BPZ, 5; 6ASN, 4; total 822.

Central Division—C.W.: 8CGN, 190; 8FT, 141; 9OX, 105; 9BDB, 74; 8UC, 59; 8ZAG, 58; 9EI, 57; 8BVO, 57; 8CAB, 47; 8CGX, 39; 8ANB, 37; 8CMI, 28; 8CWC, 21; 8ZAF, 20; 8BEK, 19; 8CYT, 16; 8BEF, 15; 9DCR, 11; 8AKP, 10; 8CLD, 10; 8BAH, 5; 8AHY, 3; 8YR, 3; 8CZG, 2; 8TT, 2; 8AIB, 2; 9CBA, 70; total 1101. Spark: 8ZO, 344; 9ZN, 204; 8AIZ, 192; 8AUX, 169; 8AYY, 80; 8FT, 71; 8AIB, 63; 8AHY, 48; 8UC, 41; 8NR, 38; 8AUU, 33; 9MC, 28; 8CMI, 21; 8TT, 21; 8EB, 18; 8BEK, 13; 8ANW, 11; 8DHZ, 10; 8BXC, 8; 8BAH, 8; 8ALK, 7; 8CGX, 6; 9OX, 5; total, 1418.

Ontario Division—C.W.: 9AL, 20; 3JI, 17; 3JK, 12; 3FC, 1; total 50.

Delta Division—C.W.: 5DO, 30; 5WO, 16; 5NV, 12; total 58. Spark: 5ZL, 14; 5XAC, 7; total 21.

Northwestern Division—C.W.: 7OT, 41; 7UU, 8; 7IY, 2; total 51. Spark: 7BK, 86; 7GE, 42; 7IY, 31; 7AW, 25; 7BG, 17; 7JF, 6; 7FD, 5; 7PQ, 3; 7AT, 1; total 216.

East Gulf Division—C.W.: 4KF, 62; 4IV, 40; 4HW, 40; 4MN, 31; 4FQ, 24; 4EG, 22; 4AU, 20; 4KU, 5; 4EH, 5; 4BQ, 5; 4HZ, 2;

total 256. Spark: 4BI, 28; 4HS, 25; 4EZ, 3; total 56;

Vancouver Division—C.W.: 5BR, 7; 5BQ, 6; 5CT, 6; total 19. Spark: 9BD, 74; 5BR, 10; 3EC, 7; 5DO, 6; 5CD, 4; total 101.

West Gulf Division—C.W.: 5QI, 39; 5ZAY, 36; 5QS, 30; 5AE, 26; 5NS, 20; 5XV, 18; 5ZAT, 15; 5IR, 15; 5ZM, 8; 5OC, 7; 5DW, 6; total 220. Spark: 5TU, 86; 5TP, 61; 5ACU, 40; 5PE, 40; 5IR, 40; 5ZAE, 30; 5NS, 25; 5QI, 19; 5RW, 15; 5TH, 13; 5ACQ, 10; 5HC, 10; 5UG, 10; 5CM, 8; 5IC, 26; total 433.

Midwest Division—C.W.: 9AOG, 109; 9FK, 86; 9BGH, 82; 9JA, 53; 9AMI, 29; 9BZI, 30; 9AMU, 20; 9BSG, 17; 9ARZ, 17; 9DKY, 10; 9BWE, 16; total 469. Spark: 9BMN, 16; 9DNC, 8; total 24.

New England Division—C.W. 1CMK, 135; 1ACU, 122; 1BKQ, 112; 1BDV, 100; 1BVB, 94; 1CHJ, 89; 1CBP, 76; 1BAS, 55; 1IV, 53; 1AWB, 46; 1AJU, 40; 1BDU, 25; 1VT, 22; 1ABS, 18; 1AYU, 21; 1BQK, 18; 1ASF, 20; 1CK, 14; 1SC, 13; 1BRQ, 3; 1OZ, 3; 1QP, 2; 1ANQ, 111; 1HX, 14; 1BGF, 10; total 1216.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

Because of reorganization no reports were received from Western New York or Eastern New York. Better get busy, fellows, or you will be dragging along through the good weather without reports. Sweep the cob-webs off your sets and show the rest of the country that you can handle traffic with the best of them. We want to see some big totals from New York, so hop to it. Appointments are being made as rapidly as suitable stations show themselves and there are plenty of vacancies to be filled.

PENNSYLVANIA: Thomas reports that his reorganization is just about completed and his stations will be in action immediately. 8AGR, 8VH, 8AHE, and 8CMB are pegging along every night. 8EX gains a good operator in 8BIL who attends State College this season. 8ZD has his district (No. 9) all completed. F.B. Owing to many changes in appointments, Rau, of Eastern Penn., lacks reports. 8ARI will be out of the game this year. 8BIQ boasts a new C.W. outfit. 8ZQ is increasing his power to 100 watts.

Heads up, men! The division manager has received a number of complaints from stations regarding reports for the Atlantic Division. The fault does not rest with the division manager. Our monthly report is made up from reports sent in by the individual stations through the district superintendents and assistant division managers. When an individual station fails to report to his district superintendent the fault rests with the station and not the division manager. Official Relay Stations have been

provided with forms for reporting message traffic and stations failing to report regularly will be dropped. There is considerably more traffic being handled than our traffic report shows but where are those reports? Remember this, there are many vacancies to be filled in the Atlantic Division and we want good stations in those vacancies. If you are in doubt as to whom you should write for appointment, consult this directory and be governed accordingly. Let's see how many of you are willing to lend a helping hand.

Division Manager, Chas. H. Stewart, St. David's, Penna. 3ZS.

Asst. D. M. Maryland, G. E. Deichmann, Jr., Park Heights and Bancroft Ave., Baltimore, Md. 3HG.

A. D. M. Northern N. J., R. S. Johnson, Red Bank, N. J. 2AWL.

A. D. M. Eastern New York, Dr. E. A. Cyriax, 219 E. 71st St., NYC. 2DI.

A. D. M. Western New York, A. H. Benzee, Jr., 196 Keystone Ave., Buffalo, N. Y. 8FE.

A. D. M. Eastern Penn., J. F. Rau, 2085 E. Kingston St., Philadelphia, Pa. 3FM.

A. D. M. Western Penn., W. K. Thomas, 17 Emerson Ave., Crafton, Pa. 8LF.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

(Detailed report received too late to be included in this issue of QST.—F. H. S.)

DAKOTA DIVISION

N. H. Jensen, Mgr.

This division has lost, by removal, one of its most faithful A.R.R.L. workers, to-wit: J. F. Carpenter, 9DX-9XI, of Minneapolis, who has recently moved to Denver, Colorado. "Carp" was city manager for Minneapolis for several years and did excellent work in organizing for the handling of traffic through Minneapolis. The Rocky Mountain Division has gained a valuable member. "Carp" reports that he will be pushing the key at 9ZAF this fall.

MINNESOTA: Traffic is still light, but has picked up somewhat since the last report. A real station is being erected at Superior and will be operated jointly by Bridges, Hagen and Kellar this winter. 200 foot towers are being built and a special building is being constructed to house the apparatus. The equipment will consist of a "knock-em-dead" 1k.w. transmitter, a C.W. transmitter of at least 100 watts and an ultra modern receiver using 3 stages of both R.F. and A.F. amplification. Traffic in this district is moving regularly from the Twin Cities to Brainerd directly and not in steps as reported in the August QST. It moves on regular schedule at ten P.M. every night from 9AUA to 9BAV. 9BAV has made arrangements with other

amateurs in that city to handle traffic only after 9:30 P.M. in order to have a listening period before that time.

9DR, 9AUA and 9APW are doing exceptionally good summer work. No other report of activities received.

NORTH DAKOTA: 9DOC has discarded his spark transmitter and is installing a 200 watt C.W. 9AEJ has been appointed City Manager of Fargo.

SOUTH DAKOTA: 9AVZ, the "young squirt," (otherwise termed "the sleeping marvel,") appears to have been the only active station in this district during the past month, judging from traffic cards received. With 50 watts he has consistently worked 5's, 7's and a number of 9's. 9YAK will be on the air with both spark and C.W. this fall and winter.

DELTA DIVISION

J. M. Clayton, Mgr.

With the approach of fall we find radio activities increasing throughout the division. Many stations, having completed their remodeling program, are back on the air and handling a good bit of traffic.

ARKANSAS: 5ZL has had his license re-issued and is giving the ether more than its share out Lil Rock way. 5XAC is putting up a new shack and two 80 foot poles to be used in connection with a real C.W. set. 5WF, while trying out his 20 watt C.W. transmitter, was unfortunate enough to blow out two tubes besides the 500 volt generator. 5ZAZ is still in the hospital as the result of a motorcycle smash. New stations in the Arkansas, all C.W., are as follows: 5AAC, 5AEH, 5FB, 5AFQ, and 5YM.

LOUISIANA: 5KC, at Plaquemine has junked his gravel smasher in favor of a 10 watt C.W. set which has been reaching out unusually well. 5ZAP, 5LA, and 5UK of New Orleans do DX work whenever QRM and the weather conditions permit.

MISSISSIPPI: 5ZAU will remain out of commission until a new Dubilier arrives from the factory. No other stations heard from.

TENNESSEE: Mr. W. W. Rodgers, 5RZ, of Memphis, has been appointed district superintendent of the western section of Tennessee, which district will be known as District No. 1. Mr. Rodgers is an active member of the A.R.R.L. and will soon do some effective work in his district. Mr. S. W. Wilkinson, 5WS of Knoxville, has been appointed district superintendent of the eastern section of the state and his district will be known as District No. 2. Mr. Wilkinson is a live wire and says that he intends to make his district the leading one of the Delta Division. Mr. Chas. Cowan, 5WO, has been appointed city manager of Knoxville to succeed Mr. Wilkinson. 5WO has a 15 watt C.W. transmitter and is doing good work. 5WS is rebuilding his

set. 5HL is beginning to reach out to a few points. 5MB is using 20 watts of C.W., but doesn't seem to reach out. Mr. Wm. Landoline, 5MO, has been appointed city manager of Memphis, Tenn. 5IK and 5OZ will be on the ether soon. 5NV, 5BW and 5LJ report that they have been doing some good DX work lately but failed to send in a report of messages handled. How cum? 5RZ has had trouble with condensers and C.W. transformers. 5DA has not operated during the month.

EAST GULF DIVISION

B. W. Benning, Mgr.

FLORIDA: District No. 1: Although activities have been on the decline this month, all of the DX men are overhauling their sets and preparing for a real season's work. 4ZE finds that the lure of the DX work and message traffic is too strong for him. He is taking the old set back to the farm and reconnecting it to a lonesome leadin and tuning her up. 4BP has erected a respectable mast and installed a well behaved gap. 4EZ has been doing a little work with his spark set this month, but the major portion of his time has been spent on improving his station in general. 4HZ is getting a nice ammeter reading with his C.W. set but is having difficulty in reaching out consistently. He'll get there soon and traffic will go through Jacksonville in fine style.

Districts No. 2, 3, and 4 can report no prominent activities, but we are assured by the dist. supt. of each district, that the DX stations will be on the job when the winter season rolls around.

SOUTH CAROLINA: The division manager wants to inform the world that South Carolina is going strong in the relay game. Mr. G. W. Etheredge, Jr., acting manager, dropped the following bomb shell on the division manager in the form of a report: 4FQ is reaching all over the country and handling traffic like an old timer. 4LA is on the air with a 10 watt C.W. set and is adding 10 more to it. 4EG is using C.W. and is putting the old traffic through in fine style. Not only is he working the northern stations but is beginning to put messages through to the Georgia, Florida and North Carolina stations. This is FB and it looks like our long hoped for relay routes are beginning to get into shape. 4JK is helping put the old state on the map by reaching out and handling traffic. Although we have no detailed report on 4JK's activities, the D.M. is pleased to say that Atlantic stations are in constant communication with him and that his sigs pound through in fine style.

GEORGIA: District No. 1: 4BQ has been off the air so long that we were afraid his new pile driving C.W. set had gathered so much dust that it wouldn't work when he tried it, but it is not the case. When

4BQ returned from his vacation in Maine and opened up on that 500 watt baby, the air around north Ga. was shattered for fair. (Honest, man, it's a crime to allow such a thing to be turned loose in the ether—B. W. B.) 4IV is leading the rest of the stations that have reported. We are glad to have you with us, 4IV, and long may you wave. 4MN is doing some fine work and has a regular daylight schedule with 4IV.

District No. 2: We know that stations in this district are handling traffic by the armfull but somehow it seems like pulling teeth to get a report through on time. What about it, you city managers and official stations?? Are you mailing your reports in on the 22nd??? In Atlanta the following stations are on the air nightly and handling traffic: 4BI, 4HS, 4KF, 4AU, 4HW, 4KU and 4EH. Although there is very little time to handle traffic until after midnight, quite a bit is being put through in spite of the continuous broadcast schedule of three local stations. 4AU is using a temporary 2 wire antenna with counterpoise, but is reaching out and doing the work. 4BI's old rock crushing spark is still burning up galena for the local broadcast listeners and is making life miserable for the whole town. (Sincerely we pray that he will junk it—B. W. B.) and 4HS has found that the only time he can work his spark set is in the early morning and is usually found about 4 A.M. pounding away in free air. Verily, the boy has brains.

District No. 3: NO REPORT. We know, however, that 4BY is overhauling his C.W. set for the winter and that 4GL is oiling up the old bug key. They will be there O.K. regardless of what happens.

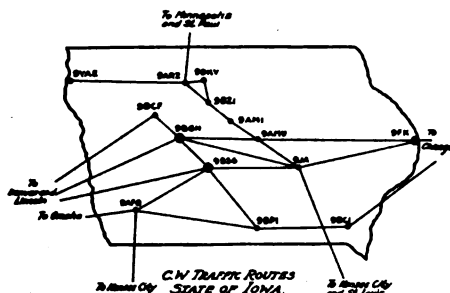
ALABAMA: NO REPORT!!! WHAT ABOUT IT MAC????? Report from station 5ZAS in Birmingham states that said station will be on the air shortly with 50 watt C.W. and 1 K.W. spark. With the C.W. they should be able to break through the barrier that has always existed between Ga. and Ala. We are looking for them to do some real work when every thing is ready. Say, you fellows in Montgomery and Mobile, let's hear from you once in a while. Has static and broadcast music completely wrecked you?? Come on, let's get busy and do something.

MIDWEST DIVISION

The Midwest Division needs considerable overhauling in several spots. There are any number of real good relay stations that represent some of the most valuable links in our main East and West traffic routes. These should be worked up to the point where transcontinental traffic may go through every night when the weather is favorable. There should be no delay even though some of the jumps to the coast represent many hundreds of miles. A con-

certed effort on the part of every Official Relay Station in the Midwest Division will bring about the desired routes that can be relied upon for this class of traffic.

IOWA: An increase of amateur work is noticed in Iowa. Most of the fellows have gotten over the fear of QRMing broadcasting and are returning to their sets with a renewed vigor. Practically every route in Iowa has been kept open the entire month through the good work of 9BSG, 9ARZ, 9FK, 9BGH, 9BZI, 9AMI, 9DKY, 9AEQ, and 9JA. 2FP and 6KA have been



copied regularly by nearly every station. The map shows the routes through Iowa that are in operation day and night and every station is doing its best to move traffic within twenty four hours. 9FK has worked over 200 miles in daylight and is on the job every morning after midnight.

NEBRASKA: Omaha stations 9HG, 9DPB, and 9DSM continue to keep the hooks clear in all directions. 9YU has established communication with Texas and South Dakota stations and offers a good outlet for all westbound traffic. The station is in operation practically all day and is in daylight range of Omaha. 9DNC and 9AYS handle all traffic for Lincoln with the assistance of 9BWJ and 9BSQ. QRN seems to be on the decline and more stations are on the job preparing for a banner year.

KANSAS: Nothing heard from this state except for a report from 9AOG who leads in message traffic for his state. 9QO is breaking out and will do his share of relaying with the others.

MISSOURI: QRN and the heat prevent work in this state. The majority of the fellows has spent but little time on radio. 9YM will be back as per usual with the cooler weather. Interest in broadcasting seems to be decreasing and the old gang will be back stronger than ever this year. Most of them have had their fill of canned jazz and the dot and dash will be the order of the day.

As a result of the election in the Midwest Division, Mr. George S. Turner, 124 Pearl St., Independence, Mo. was appointed manager of the Midwest Division. C. Himoe ran a very close second having received but a few less votes than the 132 of

Turner. Turner is an old timer at amateur radio and we feel that the Midwest Division A.R.R.L. members have made a selection that they will not regret—all of you are duty bound to get behind Turner and push the division up to the top.

NEW ENGLAND DIVISION

P. F. Robinson, Mgr.

This has been a big month for C.W.; the total traffic handled through C.W. stations being over ten times that handled by spark sets during the same period.

MAINE: Very few reports were received from this district this month, 1BAS, 1BRQ and 1BJS being the busiest stations with 1BAS (C.W.) leading in traffic handled. 1FB's summer station at Prouts Neck, Maine, (Spk. es C.W.) has been doing very good work but as Cumming is on his vacation he has neglected to report.

NEW HAMPSHIRE—VERMONT: No reports have been received from these sections of the division for some time and the division manager would appreciate any suggestions and recommendations leading to the appointment of A.R.R.L. personnel in these sections who will give us some reports for QST.

MASSACHUSETTS: McLean (1JQ) reports that all activities in the western part of the state are being handled by 1CMK and 1CHJ. So many new C.W. stations are popping up everywhere that the traffic per station is small and it is very hard to get complete reports from the newcomers. The old spark transformers are rapidly getting new secondaries put on them for C.W. and the way it looks now there will be no spark sets left (except as curios) by next year. 1BKQ (20 watts) has been reported in Colon, Panama Canal Zone. 1BQK is also doing fine work with his two five watt bottles. 1SC, one of the "spark hounds," also has a C.W. set he admits FB for DX but says it's hard to raise fellows with it. 1CNI, another spark artist, has been doing some good work and is handling a bunch of traffic but evidently is too busy to turn in a report to help out the spark percentage.

RHODE ISLAND: This is another of the heretofore reportless sections. Mr. Donald B. Fancher, 1BVB, has just been appointed A. D. M. so in the future some good peppy reports should be turned in. 1CDM has a good spark set in operation but as it blinks the lights and bothers the broadcasters he has to QRX at dusk. 1CBP and 1BVB are both doing good work with 10 watt C.W. sets. 1BVB gets on about 11:30 every night and is on until about 3:00 A.M. We understand that very soon there will be a Mrs. 1BVB to handle traffic before the OM gets on the job. FB. OM.

CONNECTICUT: 1QP reports that after trying every kind of antennae ever heard of and a few others besides, he

has returned to the good old fashioned flat-top or an imitation of it made up of small cages in flat-top form. ITS is back on the job again and sure is welcome. What is the matter with Hartford, the home of the QST factory? Is 1AW listening to the broadcasts all the time? Why doesn't 1HX lay off that cootie and send in a report, also how about 1MO and 1BHW? Let's have report from everyone who handles one or more messages per month. (OK—1BHW and 1MO—will send a report every month—but give us a chance to get going. You want QST on time, don't you? Your patience in that respect has been rewarded—QST is out on time, likewise reports will be forthcoming as soon as we can spare the time from QST to rig up an antenna.—KBW es FHS) Sa, 1QP when ya goin ta b on fr tt msg I got fr ya? —1HX.

NORTHWESTERN DIVISION H. F. Mason, Mgr.

Conditions are rapidly approaching those of winter. Many of the stations that have been off the air this summer and whom we thought had given up the ghost, are blossoming out with C.W. sets of every description. (F.B.—T.M.)

IDAHO: 7WG reports static on the decline, but no messages handled. 7ZM is deep in broadcasting. There are a few stations in Northern Idaho at present. A. R.R.L. members in this vicinity please write and send prompt reports to W. J. Sutherland, NezPerce, Idaho. 7JF seems to be handling traffic on spark in spite of the static. He has been appointed D. S. for that district. 7JD has been appointed D. S. for Central Idaho district. 7CK, and all other A.R.R.L. men in this district, please get in touch with you D. S. 7LN is the new D. S. for southern Idaho. No relaying is being done as the QRN is very heavy, and all stations are spark. Hi! However, 7LN with 100 watts, and 7CG with 50 watts of C.W., will hold down this end of the state this fall and winter. 7OT has his new 100 watter on the air, and 7YA will soon blossom out with 150 watts of C.W. The spark has been discarded at 7OI and all messages that were handled at 7OT through the heavy static that has been encountered the last month, were handled on C.W. All C.W. stations, especially those in Montana, Wyoming, and 9's, are requested to please write A.D.M. Bliss, 417 Bannock Street, Boise, Idaho, 7OT, and get in line for shovelling traffic over the Northern Route east this winter.

OREGON: 7IW, 7MF, and 7OZ handled most of the traffic, a considerable portion of which is relay traffic between Washington, Oregon and California. 7MF has worked 9WU of Denver on one 5 watter. Someone is wanted around Medford or Roseburg

to take traffic, as that district seems dead. 7BH has sold out and entered the game of matrimony. (Congrats, OM.) 7TJ is on at times, but is not handling much traffic. Everyone in Portland seems to be on a vacation, or else dead to the radio world.

(Come on, fellows, kick through with those message reports, and let the rest of the gang know you're not dead—D.M.)

WASHINGTON: Traffic has been moving with fair regularity over this section of the division the past month. C.W. is leading the way in cutting through the QRN. There are still a number of districts in the state which have no Dist. Supts. Some of these districts have no stations, and from the looks of things, will not have for some time. Districts 4, 5, 8, and 10 are still without Supts. No doubt these appointments can be filled before long. Mr. Robt. Waskey, 7UU of Seattle, has been appointed D.S. for district No. 7, comprising the counties of King, Kitsap, Snohomish, and Island. Most of the traffic in and out of Seattle is going through 7BK. 7FR has been off the air for some time, putting up a new antenna. The C.W. bug has bitten hard in Seattle; many of the gang are putting in sets, or already have them. Among them are 7BK, 7FD, 7IM, 7IB, and 7PQ. 7IY has been doing some good receiving. With a variometer set and a 1500 foot Beverage wire, (which, by the way is nothing more than #14 iron wire, common haywire) has logged every district except the first (come on, 1AW). His log includes 14-8's, 25-9's, and 5-4's. At present, 8AQO of Syracuse, N. Y., is testing with him, and if signals remain consistent over the period of two weeks, arrangements will be made to shoot traffic through on schedule all winter.

L. C. Maybee reports as follows: The summer season has started on the decline, nights are much longer, there is a grand old feeling of those winter nights on the air, and QRN is seldom very bad. Taken as a whole, this summer has been a remarkable one from the radio viewpoint. The C.W.'s have pounded through, and sparks have held an audibility that crowds the winter average. QSS has been more marked, but practically all the reliable winter sparks have held up during the summer. Traffic north, south, and west goes through fine, but the eastern work has become nil. 7TH is getting into the game with 10 watts C.W. 7ZS reports that he is having trouble hooking up with anyone, as they don't listen on 375. He is also having a hard time getting lined up with an eastern station to put his eastern traffic through. 7FI is off the job for the summer. Spokane is dead again. 7QE is out on a camping trip with his flivver. He will have some dope as to relay stations that are scattered around the state. 7AW has come into the relay game and is doing good work.

ONTARIO DIVISION A. H. K. Russell, Mgr.

Despite vacation time, Ontario division stations took a hitch in their trousers this month and lots of good hard constructive work was done. Those relayers who went on vacations took their receivers with them and did some work for calls heard.

District No. 1: 3BV has a 50 wattor going and 3NB has been copied in Toronto on tests with C.W. 3TA in Tillsonburg is putting in 5 watts C.W. 3MN has left London and moved to Windsor. 3ABX is about to burst forth with 20 watts of C.W. 3XN in London is working on 10 watts.

Gowan reports that 3BA has been appointed Deputy Radio Inspector for Brantford. Gowan, despite his convictions that broadcasting is all wrong, has gone the way of all flesh and is installing a broadcasting station for a Kitchener paper. Nothing doing in relaying though. Toronto has been decidedly lively. 3JI, 3JK, and 3FC are back from the holidays and are handling traffic nightly. 3FO and 3GE are back on spark, louder than ever. 3GE reports he is installing 50 watts C.W. 9AL is also rebuilding but will be on again soon. 3HE and others in Kingston are planning for a good relay route through there, and report Queens University has lots of power available there (C.W.) if they can be prevailed upon to use it for relay work. 3HE is taking a flier in the business end of radio.

PACIFIC DIVISION J. V. Wise, Mgr.

Hereafter all districts will be known by number instead of letter as used at present.

This change is necessary to keep all divisions as near alike as possible. District A is District 1; B, 2; and so on down the line.

The appointment of stations to their respective trunk lines will be started the first part of October, also at this time the traffic check cards will be distributed to trunk stations only. The number of stations that are out for the summer is the reason for the delay in above work.

District No. 2: Little traffic being handled due to heavy QRN encountered in the south. Aside from this, many stations are under repair, while the operators and owners

of others are enjoying their summer vacations. 6AJH and 6AVR are now adding a tube set to their equipment. The following stations made a traffic report: 6ZB, 6AJH, 6EG, 6GT, 6IV, 6AVR and 6ANX. This is a splendid showing over the last few months, and the old San Diego gang are coming into their place in line again.

District No. 3: A total of twenty stations reported this month with a combined total of 524 messages. We may note here that C.W. stations greatly outnumber spark. Excellent results have been obtained by 6EN and 6JD from radio frequency amplifiers and

loops. Work has been made possible through QRN and QRM that was laughed at when mentioned a few seasons ago. The winter will find several 100 watt tube plants going full blast, and of course, the present gang.

District No. 7: Work has fallen off due to several of the old reliables taking to sea for the summer. 6ABU, 6ASJ and 6ASN are holding down the C.W. end of things, while 6HP and 6AOA are two good reliable spark stations, the latter the well known old QRM factory that made 6ZZ famous. We



hope he keeps up its former work. 6IK and 6DR have C.W. equipment, so two sparks have gone the way of the many old timers—the junk heap.

District No. 8: The fellows in this district and particularly the gang in Sacramento have paid no attention to QRN this summer. You will find two or three on the job every night from 7:00 P.M. until 2:00 A.M. 6FH deserves considerable credit for sticking to a tube set which for some time was not equal to his concert buster, but he has his old spark beat many ways now. 6GR, the hard boiled spark owl, is heard with his 20 watt tube set and he is talking about adding two more tubes. 6LO and 6GX have gone into C.W. 6ZX is now a 30 watt C.W. instead of 20. Due to the central location of this district, traffic is handled direct to the north and south borders of the country. The summer QRN has not cut these ranges down, although the east route remains closed via the north and central routes.

District No. 9: 6CC and 6TC are the only stations working in this district; both are spark and continue to lead in the amount of traffic going north.

ROANOKE DIVISION

W. T. Gravely, Mgr.

While the report of last month for this division showed a wonderful increase in traffic handled and improvements in conditions all over the division, this month's report will chronicle an even more astounding development which might well go down in history as the remarkable awakening of the Roanoke Division. Our message report shows an increase of over 200% in the last two months. The cooperation of the entire personnel and the fine spirit shown on all sides is the reason for this fine showing in the midst of the worst part of the radio season. The proportion of C.W. to spark messages was ample proof of the ability of C.W. to overcome QRN.

Virginia and North Carolina are neck and neck in traffic handled, with West Virginia coming steadily upward. The completion of daylight schedules and conversion of BL's are the outstanding features of the month.

Fellows, your division manager is proud of you for the wonderful work done during the two worst months of the year. We led the whole United States in C.W. traffic last month and next month we will surely have over 2000. This is certainly wonderful when it is considered that several months ago 500 was considered a good month's work. You have ability to operate under the most adverse circumstances and we know that the coming season will see the Roanoke Division leading the country as it has done for the past two months.

WEST VIRGINIA: Conditions in this state are rapidly becoming normal again

and A.D.M. Heck reports that next month will show a great increase in traffic.

District No. 1: 8AFD leads with 8SP close behind him in traffic handling. 8BPU and 8AQV are also handling traffic in this section.

No. 2: No report. Let the A. D. M. know that you are still alive and kicking.

No. 3: 8CAY helps the total out with a few messages.

No. 4: 8AMD leads West Virginia. He was operating at Camp Greenbrier assisted by 5RL. While there he did considerable missionary work for the A.R.R.L. He is a confirmed traffic hound.

No. 5: 8BDB is very active, likewise 8BKD. 8ABW will be back soon.

No. 6: 8BDA, the super spark station is going strong. 8WD and 8BAZ have combined their forces in making this station THE spark station of the state. They report their signals reaching out in QRN and are out after C.W. scalps. The erection of this station has renewed the C.W.—spark war in West Virginia which will be watched with interest.

NORTH CAROLINA: Wonderful spirit shown in this state and the ability of the operators has worked wonders for the traffic report.

District No. 1: 4GX and 4DC were the only active stations. 4EN is back in the air but too late to get his name on this month's traffic report. 4NV has been appointed an official relay station and contributes to this month's total. With 4CX and 4EN back in the game together with 4NV this district will be one of the most active in the future.

No. 2: D. S. Jackson is especially active in his district and is a live worker and A. R.R.L. booster. Majority of the stations are located at Asheville with others at Shelby and Brevard. Asheville stations are on continually from 8 P.M. to 4 A.M. every night. 4IE, 4MW, 4GH, 4KC and 4LP and ADS are all active as the traffic report will show. 4LP with one 5 watt tube is getting some remarkable distances in daylight.

No. 3: 4ID is the lone member of his division at present. Charlotte still remains dead to the world as far as relay work is concerned.

No. 4: 4BX maintains schedules in all directions with two operators and is very active. 4EA is going strong. B. L. Haiiaut, at Wilson, N. C., is a new comer with the significant initials B. L., meaning broadcast listener, which he was up to a month ago. His conversion to the real game and the erection of 4NT and the 18 messages handled shows what a B. L. can do after once seeing the light. Welcome, OM, and more power to you.

VIRGINIA: Daylight work and the de-

velopment of new schedules are the features of the month. Strange to say there was not a single spark traffic report in the state. This month it is 100% C.W. Some monthly reports are missing and A.D.M. Wohlford wishes to emphasize strongly the necessity for a complete report from every district, if the state is to be represented in its true light. Reports should reach him not later than the 18th of the month.

District No. 1: 3MK is doing the majority of the work using 100 watts. 3BVC with 20 watts is also active. 3ZZ is busy with 100 ft. masts getting fixed to open up the new 500 watt set. 3ATZ, 3ACK, 3BNE, and 3ACZ are all overhauling.

No. 2: More stations are being added in this district and the fellows are getting on the job in earnest. The howl of the B.L.'s has been overcome and peace reigns. 3TJ has a regular daylight schedule with 3MK on Sunday and is also working Petersburg daylight. 3AWW and 3BNM are active in Petersburg.

No. 3: 3BVL is coming along. 3MO is back on the air and will turn in a large report next month. 3BIJ is still in the running.

No. 4: 3BLF is now working 100 watts and handling traffic consistently. He has the only station in the district and is anxious to locate others.

No. 5: 3IW is off on a naval cruise next month—we will miss his traffic. He did well this month.

No. 6: 3BHL is out of the States, consequently, no report.

No. 7: No report. There are three or four stations in this district that can be lined up to handle traffic and we need them badly. Get together, fellows and put your District on the map.

No. 8: Mr. C. M. Owen, Box 119, South Boston, Va., will take over the district at once and any stations not lined up there will please get in touch with him. Lynchburg please notice. His call is 3APR, using 10 watt C.W. Next month's traffic report will show his work. 3BZ and 3AEV are working as much as conditions will permit.

No. 9: 3HL is working C. W. and getting out some, but very little traffic is being handled.

No. 10: 3AOV is taking his vacation in the west.

ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

It is with great pleasure that I submit for the approval of the members of this division my first monthly report as Division Manager. The division has been in a chaotic condition and only by hard work on the part of all of the members of the division will it ever again resemble a good healthy

A.R.R.L. organization. Our chance lies in the time between now and the opening of the fall season, and during that time, if we get our shoulders to the wheel and by the time the QRN drops from our phones, we can have the entire division personnel lined up, and in working order for the winter rush. The advent of C.W. in this part of the country has been a great boon to our game in general. The QRN entirely blots out all spark signals from any distance, and had it not been for the little bottles, our traffic report would be almost nil. The routes throughout the entire division will be revised. All outstanding appointments, such as office appointments, and official relay station appointments, are hereby cancelled. In order to retain your station as an Official Relay Station, the individual stations should, at once, get in touch with the A.D.M. for their state, sending in the old certificates and new ones will be issued. We will consider the official stations in the division from now on, as our organization proper for the handling of special relays, tests, etc., so those of you who are official stations will do yourselves and the League justice by sending your certificate to your A.D.M. at once. If you hold office in this division send in your appointment certificates to the A.D.M. for your state, for new certificate. In the event that you are no longer to hold office you will be notified to that effect. Some of the division personnel have already been changed, and the change was made because those who were in office failed to do their part. It takes just a few hours work a month on the part of the division official to make things hum and just a few minutes work on the part of the individual station owners. The division manager is looking at you all alike, that is, you will do your part until he is shown different, and then changes that are necessary surely will be made. The A.R.R.L. has made it easy now for each station to report its traffic, so please use those cards to forward your report to the A.D.M. or Dist. Supt. When you run out of cards notify your Dist. Supt. or A.D.M. in time so that you will have a card on hand for next report and they will be forthcoming. The division personnel now stands as follows:

A.D.M. for Colorado: R. C. Schryver, 2111 So. Franklin St., Denver

A.D.M. for Wyoming: F. N. Mitchell, Box 575, Greybull, Wyo.

A.D.M. for Utah: Elliot Johnson, Ephraim, Utah

Dist. Supt. Colo.: Philip Laskowitz, c/o Reynolds Radio, Denver

Dist. Supt. Utah: Evan Seegmiller, Richfield, Utah

The A.D.M.s have their eyes open for good men. Great things will come of amateur radio this winter so you who are am-

bitious, and get busy will be on the official ship. We need several Dist. Supts. and City Managers, and they will be picked within the next few weeks, so get busy and let your A.D.M. know what you can do and the extent of your ambitions so that we may get our new men. The A.D.M. of your state will handle this entirely so what he says regarding appointments in his state will be final. The certificates will be issued from the division manager's office.

The new routes will be made up as soon as the D.M. can get a check on the good stations. It would help if the relay stations in the division would notify the A.D.M. what stations they work best so that we may work up the most logical routes. Those who can work on a schedule are especially wanted. Just sit down and write your A.D.M. a letter, explaining what you have done, what you can do with your station, and what you would like to see done in the division as we are here to please the majority and to work together toward one end—the advancement of amateur radio and the A.R.R.L.

COLORADO: Traffic through Colorado has shown an awful slump due to stations not reporting their traffic. There is no excuse now as the cards have been mailed for the purpose of sending reports in to either your Dist. Supt. or the A.D.M., of the traffic handled.

Stations 9BXA, 9DVJ, 9BUN, 9XAQ, 9AYU, 9AMB, 9DTE, 9BXQ, 9DUC, 9DHI, 9BJI, 9XAI, 9DTH, 9AWL, 9DTM and 9DVA are all in operation in Colorado and with the addition of the stations that always open up when the season becomes good, Colorado will have a bumper season this winter. Stations 9XAI and 9XAQ are schools and are of course closed through the summer season. 9XAQ has been a good station in the past and we are anxiously waiting the opening of the station again.

9DUC has arrived in Denver from Chicago where he has been giving the radio activities the once over and will soon split the air with his set. 9AWL is rebuilding from aerial to ground. 9DHI reports sigs. QSA on his Reinartz and is ready for traffic. 9DTE has two "fifty watters" about ready to split the phone diaphragms. We will bend our efforts this year more than ever to the establishing of routes, on which we will have our most reliable and consistent operators and a place on them will be worth having if you really want to relay, or if you really have the interests of the League at heart.

WYOMING: 7DH has 10 watts C.W. and phone on a ranch in the mountains and has a 32 volt lighting system from which he will run his motor generator set. 7ZV, another one of our old timers and who had the prize spark set in Wyoming, has turned up his toes and quit his spark,

but has a neat 20 watt C.W. and phone. 7AFW is a new comer among us. He is working 10 watts C.W. and is QSA at Casper in daylight. 7GK sends no report of the activities down his way.

UTAH: Utah is rapidly getting ready for the winter rush. 6ATQ and 6ATH are each installing 10 watt C.W. sets and 6BNJ is putting in five watts. All the old gang with their rock crushers and C.W. sets are ready and traffic is moving a bit now. QRN has been unusually heavy this season, only three nites which could be called good nites, throughout the entire month.

Mr. Evan Seegmiller has been retained as Dist. Supt. for District No. 2, which includes Provo and all the territory south thereof. Any Utah station who is or thinks that he is qualified to be an official relay station, get in touch with the A.D.M. so that the new routes can be made up at once. We need a Dist. Supt. for District No. 1, the territory north of Provo, so put up your man, gang. This must be done at once as we feel the need of him already. Utah stations please get in touch with the A.D.M. as soon as possible. Address 6ATH, Ephraim, Utah.

VANCOUVER DIVISION

W. D. Wood, Mgr.

5CN has just raised a beautiful specimen of a 90 ft. B.C. toothpick and will be going strong with 50 watts C.W. 5AK is open for traffic. There are several stations in P.R. that will make themselves heard before long. 5CX now has a 15 watt C.W. set built for him at Vancouver by 5BR. 1200 miles was covered the first night with this set when tried out at 5BR, and only ONE VT-2 was used at the time. We are still waiting for a good transmitter and relay station for Victoria. 5CT is getting out fairly well on 5 watts C.W. He is increasing power and remodeling. Present indications point to a very good relay season and when the time comes for a Trans-Canada Relay test the Vancouver Division will be QRV-GA. At Calgary, Alberta, we now have CFCN, with 100 watts of C.W. on 275 meters. CFCN is handling traffic with 9BD on schedule. Among the Vancouver amateurs there are 5DO, 5EC, 5DK, 5CJ, and 5CD who are on at various times, but don't get very far.

How about that Trans-Canada Test, you easterners?

WEST GULF DIVISION

F. M. Corlett, Mgr.

El Paso Texas, and the nine counties immediately east have been re-assigned to SOUTH TEXAS SECTION. This District has been under the supervision of the New Mexico Asst. Div. Manager for some time on account of communication difficulties be-

tween Houston, Texas, and El Paso. This, however, has been overcome and the re-assignment to south Texas was deemed advisable. A dist. supt. for this district, which will be known as District No. 4, South Texas, will be announced next month.

District Superintendent appointments for Oklahoma are:

No. 1. Northwest Oklahoma: Chas. E. Whartenby, 5ZM, 801 West Oak St., Enid, Oklahoma.

No. 2. Northeast Oklahoma: C. M. Selby, 5BM, 1163 Locust Street, Muskogee, Oklahoma.

No. 3. Southeast Oklahoma: J. Wayne Cargile, 5KE, 209 Second St., McAlester, Oklahoma.

No. 4. Southwest Oklahoma: Donah. H. Boyette, 5DS, 111 North 7th Street, Lawton, Oklahoma.

Members having transmitting stations that desire to secure official relay station appointments should communicate with the dist. supt. of their district. There are a few stations in Oklahoma that are not members of the A.R.R.L. To these we extend a cordial invitation to join as relay work is really radio pleasure.

We are glad to welcome one of the old timers, Roy. W. Layton, back in active relay work. Roy Layton is in charge of 5AEJ, an excellent amateur station owned by the Allison Motors, Corsicana Texas, and he has been selected as district superintendent for district No. 2, north Texas. A number of official relay station appointments have been issued. No report has been received from assistant division manager, Louis Falconi, of New Mexico section this month.

SOUTHERN TEXAS: Prospects for a splendid relay season were never better than they are at present in this portion of the state. There has been an early cool spell which has added to the already increasing interest in relay work. Practically all stations in the vicinity of Houston will be using single circuit tuners for C.W. reception for they have already proven themselves to be just what the DX relay man has wanted. [?—Ed.] The reorganization of the traffic department has done much already toward a very successful system of operating and is already showing the result of a chain of higher class stations. Southern Texas has been divided into four districts as follows: No. 1 is east Texas, and is supervised by Harvey C. Sundstrom, 5AAU, district superintendent, 1716 Lubbock St., Houston, Texas, and application for official relay station appointments for east Texas should be addressed to him. No. 2 is designated as Central Texas and is handled by E. A. Sahm, New Braunfels, 5YK. No. 3 is known as West Texas, and comprises that portion of the state from Bexar county to the Rio Grande; 5ZAE, L. D. Wall, 216 Pereida St. at San Antonio has been ap-

pointed dist. supt. No. 4 will be known as Far West Texas, and will be composed of nine counties adjoining El Paso. Dist. Supt. for that portion not yet named. Radio clubs and isolated individual stations are requested to correspond with their dist. supt. nearest in order that all traffic routes may be completed at the opening of the relay season. The requirements for obtaining an official relay station appointment are: A station that will be kept in constant working condition (not torn down from time to time, rebuilding, enlarging, etc.) and operated at least a few hours daily to clear traffic; a dependable operator who will try to keep his hook clear; and a member of the A.R.R.L. If you can qualify to the above three cardinal requirements, your district superintendent would like to get in touch with you at once.

5AE, 5XV, 5HZ, and 5OC are the busiest stations at the present writing. In central Texas, 5CG gives promise of an excellent relay point; the station is located on top of the Cotton Exchange and is operated by Marion Apple, formerly of McKinney. 5QA and 5ZU are among the few central stations in operation.

West Texas report is short but interesting. 5ACU leads with 5ZAE a close second, and 5HC as a good third. 5ZAK has moved back to Camp Travis and is building a new shack and everything. Practically all traffic in this district has been handled on an "early morning plan." Laredo is still in the game though heavily handicapped this month by electrical storms daily. 5MT and 5ZAN both building better sets, as usual.

Far West Texas is coming on nicely with renewed life at El Paso. Some good C.W. sigs. from there have been coming east in fine shape.

OKLAHOMA: 5ZAT is constructing a self-supporting mast 130 feet high, which when completed will give Okla. City two of the highest amateur masts in the southwest. 5ADQ is installing a 100 watt C.W. 5ZG has completely rebuilt everything and will be going strong again with the 100 watter. 5BM is having quite a time getting things arranged for winter work. 5LB seems to be getting out in fine shape now. In our North West Dist. No. 1 we are going to rely almost entirely upon 5ZM as he appears to be the only operator who will be on every nite. 5PU and 5ZZ will be on part of the time. 5XT will handle traffic when WKY is not in operation.

NORTH TEXAS: Traffic in this section seems to have picked up a little over last month's report, as there is still a great deal of rebuilding and broadcast listening which seems to have the lead at present. 5ZH will open a route west to the coast working spark and C.W. on 200 and 375 meters. C.W. will probably solve the prob-

(Concluded on page 57)



British Relay League Formed

We note with pleasure in *The Wireless World & Radio Review* that Mr. Y. W. P. Evans, Hon. Secretary of the Manchester (England) Wireless Society, has obtained permission from the Postmaster-General to form a British Wireless Relay League and solicits correspondence with British amateurs with a view of forming such a League as early as possible. Heretofore we have understood the P. M. G. has been of the view that amateur relaying must be prohibited because it was a kind of competition with the telegraphs, which in Britain are owned by the government; and this attitude has hitherto held to such an extent that only testing has been permitted to British amateurs. The present authorization must be interpreted as a most pleasant indication of the growth of liberal views in radio matters abroad.

The A.R.R.L. has been in correspondence with the gentlemen proposing the formation of the B.W.R.L. and hopes to be able to co-operate with them as a sister organization in trans-atlantic relay activities. Best o' luck!

Need for an International Language

The A.R.R.L. is continuing its examination of the possibilities of an international artificial language for official adoption for use in international amateur communication. Members who are informed on the subject are requested to write the Secretary and present any helpful suggestions that occur to them, particularly whatever arguments they may be able to advance in favor of any certain language for this purpose and data on the extent to which the said language is organized thruout the world.

Esperanto is a favorite at the present writing but its opponents charge that it is very difficult to express oneself in the semi-technical conversation of amateur radio in that language, which they contrast with the possibilities of Ido, another such language which seems to have many boosters. The Secretary will be glad to hear from the disciples of these respective languages.

England Transmitting This Winter

The Manchester Wireless Society expects

to have a 1 k.w tube transmitter in active operation thruout the coming winter for the special purpose of testing with American amateurs. The antenna is already erected. This station is Britain's main hope in the "west-bound" Transatlantics announced elsewhere in this issue.

Coursey with Dubilier

Mr. Philip R. Coursey, late assistant editor of *The Wireless World & Radio Review* and manager of the British arrangements in the Transatlantic Tests of last winter, is now attached to the Dubilier Condenser Co., Ltd., as technical expert, with offices in London.

British Broadcasting

At last a definite scheme seems to have been agreed upon in Great Britain for the handling of the broadcasting problem. Articles of association have been prepared for an organization known as the British Broadcasting Company, to be owned by the manufacturers desirous of participating in broadcasting and to which any bona-fide British manufacturer is allowed to become a member. The arrangements are awaiting the approval of the Postmaster-General at this writing.

The license fee for broadcast-receiving stations is being increased from \$2.25 to \$4.50 per annum, the amount of the increase to be turned over to the Broadcasting Company to apply towards the expenses of operation, and a further contribution will be paid by the manufacturers as a percentage on each set sold by them. Profits of the broadcasting company are to be limited to 7½% per annum.

No foreign-made wireless apparatus is to be allowed in Britain for a period of two years. They are differentiating in the licenses between broadcast receivers and true experimental or amateur receivers. The former must be of such a design that they cannot tune below 300 meters or above 500 meters, must be absolutely incapable of radiation, and, we understand, are prohibited the use of the single-circuit tuner.

There will be eight transmitting stations, situated in London, Birmingham, Cardiff, Manchester, Glasgow, Aberdeen, Plymouth, and Newcastle, all run on different wave

lengths, and of sufficient power to be heard anywhere in the country with a three or four-tube set. Daily broadcasts from 5 o'clock to 11 P.M. are contemplated.

French Letter

Dr. Pierre Corret, frequently mentioned in our columns as the editor of *La T.S.F. Moderne*, organ of the *Société Française d'Étude de Télégraphie et de Téléphonie Sans Fil*, of which society he is also the vice-president, very graciously has agreed to



Here is Dr. Corret at a receiving station which he constructed in the French army during the war. In 1914 and 1915 he was in a little village in the Vosges. No tubes were available and he had to make use of cardboard tubes for the coils, odd bits of wire for the windings, wood rulers for the sliders, and he had even to make his square holes with a half-round file! In spite of which, however, this set worked very well and copied German messages which the headquarters set could not pick up.

give us a summary of interesting French amateur news from time to time. We present his first letter with pleasure:

"I will send you herewith the information which may interest readers of *QST* on the subject of the development of amateur radio on this side of the Atlantic.

"The most interesting thing at this moment is the preparation of the new law on radio. To tell the truth, there never was a truly legal definition of reception. Ten years ago when I published the first amateur manual in France, they presumed merely to absolutely prohibit receiving, and this by the simple decision of the Under-Secretary of State for Post and Telegraph, altho a law would have been necessary. Then there were a whole series of decrees, just as illegal as the Under-Secretary's of the State. These decrees no longer prohibited reception but presumed to compel the amateurs to request an authorization and to pay a tax. Finally, during these later years, they have prepared a law according to which it is not necessary to request authority but it is necessary to make a declaration and to pay a tax.

"The progress in ten years is evident as tending towards legality and liberty; first the simple decision of the Under-Secretary of State prohibiting reception; then the decrees prescribing the request for authority, and finally a law asking nothing more than a declaration.

"In addition, the juridical sub-commission entrusted with preparing this law submitted the project to the principal manufacturers or constructors and to the amateur societies, in order to have their advice on the subject. Such a thing as this had never been seen here before and shows that they are beginning to consider the amateur in France as no longer a negligible quantity. This communication on the other hand had the effect of showing the juridical sub-commission that it was not easy to regulate receiving and the commission has, it seems, abandoned for the present the idea of framing a law. On account of the probable progress in the science of radio it is going to issue provisional decrees.

"But I ask how can these be legal, and above all how they can be applied or enforced, for, up until now, never a one of the decrees were ever enforced! What will it be now when any one can receive at home on a loop without anyone knowing anything about it! The new law or the new decrees will be enforced no more than the others were and we will therefore come little by little to the inevitable normal turn of evolution; unrestricted and free receiving and regulated transmitting. But for this we must let the old administrative routine have time to adapt themselves to new conditions!

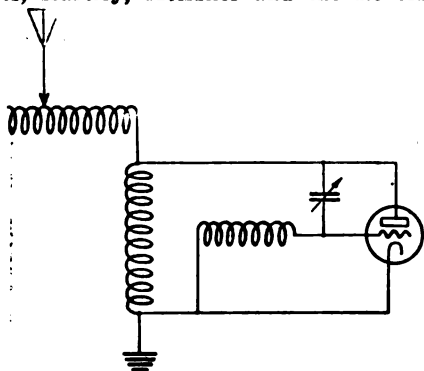
"We complain in France, but conditions in Switzerland are a lot worse! The general administration of telegraphs there has just put out some absolutely grotesque decrees regarding tests which might be made thru radio telegraphy. And yet "Free Switzerland" is commonly mentioned in Europe as almost equal to "Free America"!

Those who wish to make a receiving test must ask for authority 15 days in advance. Such authority is subject to a tax of 10 francs when the entry is made. An official of the telegraph administration is present at the test and watches to see that the reception of signals is made within the prescribed limits. It is forbidden the tester, as well as his assistant, to listen to or copy signals heard during the course of a test and to give their meaning to a third person. It is likewise forbidden to make use of loud speakers or any kind of automatic recorder. All this is to avoid divulging telegrams which any amateur might receive at home

on a loop without the telegraphing administration being able to stop him listening!

"The free Americans might well laugh at the assinities of poor old Europe!"

I read with interest in the June QST your little article on page 32 entitled "Circuits." Besides the four hookups mentioned, Colpitts, Hartley, Meissner and the Reversed



Feedback, the French army uses another hookup with electrostatic coupling between the grid and plate, which may be shown as follows, using a diagram similar to yours.

"You ask me as to my opinion of the value of Esperanto for transatlantic communication between the amateurs of America and Europe. I am convinced that it is very convenient and easy to understand. I needed only 20 days to learn it well enough to correspond with Esperantists speaking 30 different languages, and some months to speak it with men of many different languages in the International Congress of Esperanto.

"I am certain that for telegraphing communication one month would be sufficient for the intelligent American, and even less if they already know a foreign language.

"Before Esperanto there were many international languages proposed. Idiom Neutral is one of them. But this remains only a project and is not practical. In the same way, after Esperanto have come many other projects of different individuals who have always found "something better." The most noted is Ido, which got a lot of publicity and made a lot of noise, but did not collect many experts. It is easy to make up a new language the same as it would be easy to make a "better" Morse code. But what would be the use if each one had his own "better" code? The important matter is that all have the same. The same holds true for an international language. Esperanto shows itself very good and now has many experts throughout the world. Without doubt another language just as good could be made up or even "better," but the only important thing is that everyone speaks the same language!

"I think the adoption of Esperanto is a

necessary consequence to the development of radio communication and particularly that of radio telephony, where understanding must be immediate. The idea is coming to all the world.

"On the subject of transatlantic transmission tests with French amateurs next winter, I don't see hardly anyone but Mr. Deloy, 8AB, who can possibly be ready. Perhaps there are other stations in Great Britain and in Holland, but it seems to me that perhaps it might be a bit premature to silence all the American transmitting stations in order to hear only a few European stations. But I am convinced, as you are, that if it doesn't come off this winter it surely will the next."

THE OPERATING DEPARTMENT

(Concluded from page 54)

lem of working A.R.R.L. traffic through broadcasting hours. 5QS has been reported by 8HJ. 5DW has just completed a very efficient C.W. set, 5IC is reaching out with his new C.W. set using the 9DDY circuit radiating one-half ampere and has worked 150 miles; also has been heard by 9DZR and 9DUG on his one-half K.W. spark. 5AAR is doing some fine work with 100 watt C.W. 5QI has just completed a new C.W. 20 watts, and has worked 7LU.

We are sorry to lose one of our best official relay stations, Mr. Ruch A. Hall, 5PE, who is now at Ringgold, La. (Clayton note). 5CM is using a 1 K.W. spark and gives promise of being a good relay station. 5TH of Paris has a new C.W. going now and welcomes traffic that way.

WINNIPEG DIVISION

J. H. Gjelhaug, Mgr.

J. E. Maynard reports very little doing this month. 4CB is rebuilding and will have 100 watts C.W. 4EZ is also building a good C.W. set. 4GB of Saskatoon is now going strong using 4CB's old 15 watt C.W.

H. D. Clark says there is something stirring and that there will be something doing before long. Winnipeg amateur stations are getting their heads together and we look for some good stations there by winter.



Who's Who in AMATEUR WIRELESS



WINIFRED DOW



M. ADAIRE GARMHAUSEN

Ahh! At last! The Ladies' Number of Hooshoo! You know, gang, we have been wondering all this time what these Y.L.'s look like and now after years of pestering we have got them to come across with enough dope to introduce themselves. Both of 'em did it at about the same time and it was such a shock that the editor immediately thereafter took a couple of days' vacation and his assistant decided to get married! Not that it directly affected us thusly (apologies) but the relief was terrific and we heaved a sigh not unlike that of a power tube when the tip is knocked off. Modest as the present-day girls are, we gleaned the following data which we present with a pride equal to that of unearthing a new method of reception.

Miss Winifred Dow, otherwise known as 7CB, is without doubt the most prominent feminine operator west of the Mississippi River. We didn't dare ask her how old she was so we will have to draw our own conclusions from her statement that she was born in Tacoma on July 15, 1902. She claims she is "just a plain ham like the rest of the boys—and girls," but we think different. As evidence that she's a regular fellow, however, we must report that she has been caught at 1 o'clock in the morning up to her elbows in a tank of oil fixing a punctured condenser so as to get back on the air!

Starting in radio in 1916 she thinks she has not progressed any but again we think she is spoofing us. We know that she has been a staunch booster of amateur radio and a member of our A.R.R.L. for five years, and for the last several years she has served as A.R.R.L. District Superintendent. Miss Dow has been secretary of the Radio Club of Tacoma for two years. In the Washington's Birthday Relay last year in which hun-

dreds of the best amateurs all over the country participated and seventy-eight prizes were given, 7CB took second prize. But the following incident shows she is a true amateur and in a way that will make some of you who profess to be amateurs blush for shame. Miss Dow, like many other amateurs, was offered a position in a broadcasting station. For two months she was broadcaster and radio editor of the "Tacoma Ledger" but because it kept her away from her own set nights, she gave up the job, and, in her own words, is "happy to be a ham again instead of an editor or broadcaster." *Here is an amateur!*

Miss Marion Adaire Garmhausen hardly needs any introduction as most of us have heard of her in one way or another. She admits she was born May 28, 1899, but swears she does not look a day over sixteen. Being a telegraph operator by trade, she went to wireless school just after the war and found a *QST* somebody had left lying about (careless!). Our budding Y. L. says she was struck by the spirit of the organization and wrote Mr. Duvall, whose name she found in the magazine, for further particulars. His reply harmonized exactly with the spirit of the magazine.

When she put in her first set the reigning forces offered her every discouragement known to mankind, so she retired to her shell. Her articles in July, 1920 *QST* ("How to Build a Wireless Station") and May, 1921 ("Breaking Out") tell in her own words of her experiences in getting started, so any attempt on our part to repeat the tales of woe would at best be infringing on her original masterpieces. 3BCK (for that is her call) remained in her shell until the organization of "The Radio Condenser," sometime Third District organ, when the remorseful crowd invited her to join them. And she was not merely decorative, either—she was of real help on the "Condenser;" and she likewise was an active force in the planning and management of the hugely successful Third and Fourth District Convention in Washington last February.

However, they say she doesn't often venture out thusly. No ham has ever laid eyes on her station, despite sundry pleadings, and she swears "no ham ever shall until I get darn good and ready to let him." Ain't it like a woman! She admits her room "looks more like a blacksmith's shop than a young lady's 'boojwar,'" and in view of all of this discouragement we have given up hopes of having a photo of 3BCK in our "Amateur Radio Stations" department.

In spite of all her modesty we find that Miss Garmhausen holds two certificates in electrical engineering and is working for the last one necessary to get a diploma. We know she has been an ardent booster of the League and always will be, and it is her ambition some day to have to move to some place where her set will be able to fill a necessary place in A.R.R.L. relays.

Vivent les hamettes!

BeeP.

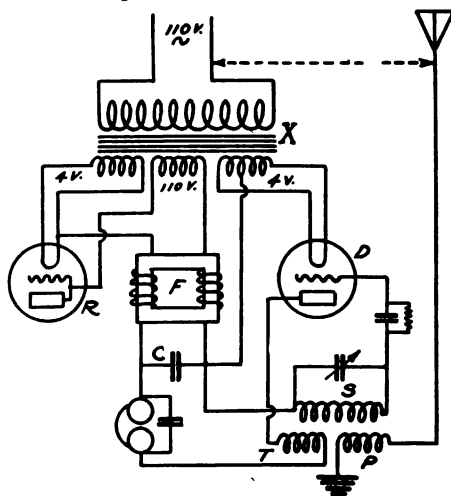
TUBE SUPPLY FROM A.C.

(Concluded from page 40)

be formed with the inductances which in connection with an appropriate capacity in the storage condenser absorbs a maximum of the residual A.C. component. The article in "L'Onde Electrique" gave no exact details on how this was accomplished but suggested that at F in the figure there be two inductances of 1500 turns, one in each side of the circuit, arranged to buck each other on the same closed iron core.

An apparently vital part of the arrangement is that M. Ritz used for his aerial a spare wire in the overhead supply system, presumably like the topmost lightning-protection wire in a transmission line rather than the common or neutral feeder, which aerial wire is in inductive relation to the "live" wires and the coupling between which probably helps to balance out the A.C. component. Still, we see no reason why it should not work as well on aerials not associated with the A.C. supply. As to results, numerous long-wave C.W. stations are copied with the A.C. hum entirely negligible, while the hum is heard weakly in the non-oscillating regenerative adjustment for

spark or phone reception; no short-wave work is reported.



Are any of our readers having success with any such system?

—K.B.W.

The Junior Operator

(A department formerly known as "With Our Radio Phone Listeners.")

How to Tune a Three Circuit Tuner

ALL single-tuned-circuit receivers have the inherent characteristic of tuning rather broadly and may also prove a nuisance to the community because of the strong waves they may cause to be radiated. In congested areas where interference is bad the three-circuit tuner is very much to be recommended but because of its more difficult adjustments it takes some time to be able to get the most out of the tuner, especially when it is left to the operator without the help of a friend.

The ordinary three-circuit regenerative receiver has four adjustments that require attention: the series condenser in the antenna lead, the vario-coupler adjustments (taps and coupling), the grid variometer or secondary condenser, and the plate variometer. The latter controls the regeneration while the first three control the wave length and selectivity.

Either a variable condenser shunted across the secondary of the vario-coupler or a variometer in series with the grid serves to tune the secondary circuit, while the antenna series condenser with the primary coil of the vario-coupler tunes the aerial circuit. For the best signal strength it is imperative that these two circuits be adjusted to exactly the same wave length. Even when so adjusted a nearby station on a wave differing considerably from the wave to which the set is tuned may be picked up very strongly so an additional adjustment known as coupling is provided which regulates the transfer of energy from one coil to the other. Loosening the coupling slightly decreases the energy transferred but greatly increases the sharpness or selectivity so that interference is greatly minimized. This is the big advantage of the three-circuit tuner over the simplified types.

With the set operating normally and with loose coupling it will be noticed that as the plate variometer is turned there is a point at which a click or dull thud is heard. Below this point the phone, spark, and I.C.W. stations are best copied, as above this point the set is oscillating, which is the condition necessary for the reception of C.W. telegraph signals. When the tuning of the secondary circuit is changed the

point at which oscillation occurs in the adjustment of the plate variometer will change correspondingly.

Now with the coupling fairly tight and the secondary tuned to approximately the desired wave (which may be known by previous experience or by calibration from a buzzer-excited wave-meter), the plate circuit is gradually brought into resonance with the secondary circuit by turning the plate variometer slowly. Just before resonance is reached the tube "flops over" into oscillation. With the set oscillating the aerial circuit is then tuned to resonance. When the series condenser knob is turned it will be found that the set stops oscillating at a certain point but as the knob is turned farther it starts again. This is because the aerial when tuned to resonance with the oscillating set absorbs energy and, the detector tube being a weak oscillator, energy cannot be supplied as fast as the aerial circuit absorbs it, so the oscillations are stopped. Set the condenser at about the middle of this space where oscillations do not occur and turn the plate variometer until the set oscillates again. Continue with the series condenser as before and it will be found that only over a very small part of the scale are the oscillations stopped. This should be narrowed down to a degree or so. When this adjustment is obtained all the circuits are in resonance and at the best possible tuning for that wave in the reception of spark, I.C.W., and phone.

Continuous wave signals may be received by turning the plate variometer further to the right or loosening the coupling. If the signals are loud the latter adjustment is recommended as the sharpness of tuning is increased and spark interference to a much greater extent eliminated. In attempting to find a station tight coupling is generally used, but in working, very loose coupling is desirable.

Dispensing with resonance for the moment, the variation in the plate circuit of the detector depends mainly upon the variation of the grid voltage. The secondary circuit of the receiving set may be a coil of several turns shunted by a very large condenser or it may be a much larger coil shunted by a very small condenser. The variometer tuned secondary circuit is

the type where the inductance is large and the capacity only that present in the coils themselves, known as distributed capacity. With this type of set the voltage variations on the grid are considerable and a strong signal results. The honeycomb receiver in which the secondary is tuned with a shunt variable condenser decreases the grid to filament voltage somewhat when this capacity is made large but makes a "stiffer" circuit not so liable to be affected by oscillations of another frequency. Therefore, with the secondary tuned with a variable condenser, for the best signal strength the capacity should be kept low, but if the signals are loud and the interference bad a smaller coil and more shunt capacity is to be recommended.

These are merely suggestions to the beginner who has been told by amateurs to junk his two circuit tuner and get a three circuit tuner and who, after having purchased one, finds difficulty in getting equal results.

B.P.

Construction Pamphlets

The third of a series of pamphlets put out by the Department of Commerce, Bureau of Standards, in the form of Letter Circular LC 48 describes the operation and construction of a detector unit. Circular No. 120 describes the construction of a single-circuit tuner and Circular No. 121 tells how to make a two-circuit tuner. Any of these may be obtained for five cents in cash from the Supt. of Documents, Govt. Printing Office, Washington, D. C.

Hydrometer Readings

In an article in this department three months ago the factors to consider in the choice of the battery were considered, so a little talk on the use of the hydrometer may be appropriate at this time. Most radio bugs know that it is necessary to use a hydrometer to test a storage battery but some do not know exactly how to go about this simple job, and as a result of improper care of their battery, its life may be considerably shortened.

The electrolyte in the common lead cell is a mixture of sulphuric acid and chemically pure water. The specific gravity of this electrolyte is the ratio of its weight to the weight of an equal volume of water. The specific gravity of water then is taken as a standard and is 1.000, while sulphuric acid being nearly twice as heavy has a specific gravity of nearly twice as much, depending on its purity. It should be apparent that specific gravities between these two limits could be obtained by various proportions of acid and water. The correct mixture varies with the type of duty desired and with the manufacturer. What concerns us chiefly is the fact that the

specific gravity in any given battery varies with the *degree of charge or discharge* and that this is about the easiest way to determine the exact condition of the battery. Almost any good electrical textbook devotes a chapter to electro-chemistry where the reader may learn more about the exact chemical combinations that go on in the cells, but suffice it to say here that discharge is a chemical action in which acid enters the plates of the battery, and charging is the reverse process of driving the acid out of the plates into the electrolyte. The electrolyte is therefore "stronger" or has a greater specific gravity when the battery is fully charged, and as discharge progresses the specific gravity falls off accordingly.

So far we have barely mentioned the instrument that is to do the testing—the hydrometer. The most convenient form is known as a hydrometer-syringe, which includes a container for the hydrometer float and a rubber bulb for raising the electrolyte up into the glass chamber with the float. The hydrometer has a graduated scale on the inside of the tube reading from 1.150 to 1.300. A fully charged cell will register about 1.250 to 1.280 and a completely discharged cell about 1.150. On many hydrometers these two points are plainly marked with a red line.

The important thing to remember in the care of the battery is not to let it completely discharge as it is much better to put it on charge when the specific gravity falls to 1.185 than to wait until it is completely exhausted. A discharged battery must not be left in that condition as the acid in the plates quickly destroys them by what is known as sulphation.

Hydrometer tests are made as follows:

- (1) remove vent plugs from top of cell,
- (2) force the air out of hydrometer by compressing the rubber bulb, (3) insert the rubber tube of syringe thru vent hole into the electrolyte, (4) release the bulb and draw up a sufficient amount of the electrolyte into the glass tube to float the hydrometer, (5) note the point on the hydrometer scale which appears level with the top of the electrolyte when the hydrometer floats freely, touching neither top, bottom, nor sides, (6) force the electrolyte back into the cell from which it was removed.

If possible, readings should be made without lifting the rubber tube out of the cell as destructive dripping is thus eliminated. It is also advisable to rinse the syringe out with water or it will badly mar any material it comes in contact with due to the residual acid.

With ordinary use, only water needs be added, as the acid does not evaporate. Hydrometer readings must be taken before water has been added, as a thorough mixing

(Concluded on page 68)



Amateur Radio Stations



4BQ, Rome, Ga.

Although 4BQ was described in this department some time ago when spark sets were the berries we cannot refrain from giving credit to the C.W. set of Mr. G. L. Hight, recently completed, as there are many points in arrangement and design that will undoubtedly form a valuable guide to others about to graduate to the larger tube sets.

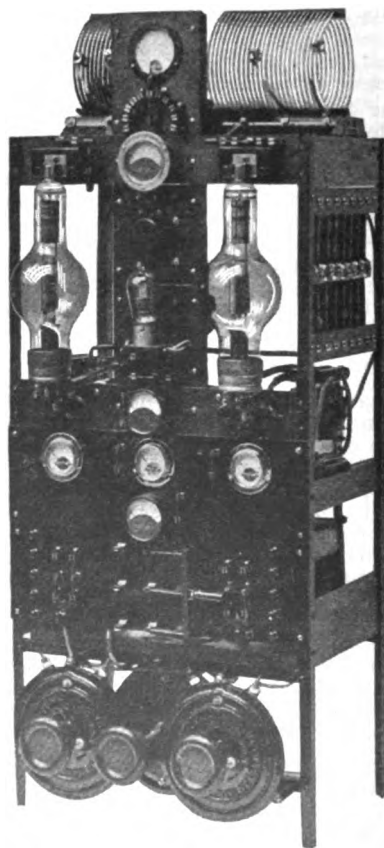
The antenna is an eight wire cage 90-ft. long, spread on 8½-ft. hoops and running almost vertically to the top of a 125-ft. mast. The mast is built up of two 23-ft. lengths of 2-inch pipe welded together and reinforced at the joint with a 4-ft. piece of shafting turned to a driving fit; all this on top of an 85-ft. steel tower. A counterpoise of 18 wires 50-ft. long and 50-ft. wide at the end caused a doubling of antenna current and is tuned to the ground circuit which in itself consists of almost every metal object imaginable driven or buried in the premises.

The spark set consists of a Thordarson 25,000 volt 1 k.w. transformer, heavy pancake type oscillation transformer with 6 inches coupling, Dubilier condenser of .01-mfd. capacity, and a home-made synchronous rotary running at 1800 r.p.m. but with twelve teeth spaced at intervals of a sixteenth of the circumference and every fourth space left open. The open spaces are adjusted to come at the zero point of the A.C. wave, resulting in a peculiar note easily read thru QRM and QRN. This set has a record of 1500 miles.

Up until the last month or so, the C.W. set of 4BQ has consisted of four five-watt tubes and put out 4½ amperes. This set has been heard in every state in the United States on C.W. and I.C.W. and is at present running down a report of having been heard QSA by 6ZAC in Honolulu.

The set which we take great pleasure in presenting is No. 3, which has just been completed and is shown in the accompanying photo. This set consists of two 250-watt tubes using the "sure fire" circuit modified slightly to place the filaments at ground potential. There are three separate plate currents available: No. 1 is 500 cycles from a 2500-watt generator and

stepped up to 2500 volts, No. 2 is 2000 volts of D.C. supplied by a 1500-watt motor-generator, and No. 3 is 2500 volts of rectified A.C. This latter supply includes an electrolytic rectifier with 42-cells in each leg, and a choke coil in the positive lead



of 10-henries, followed by a 3-mfd. condenser shunted across the line. The filaments of the tubes are excited from two separate transformers with their center taps joined in common. A 42-ohm rheostat in the

primary of each transformer gives very smooth filament control. Separate filament voltmeters and rheostats for each tube are plainly seen in the illustration.

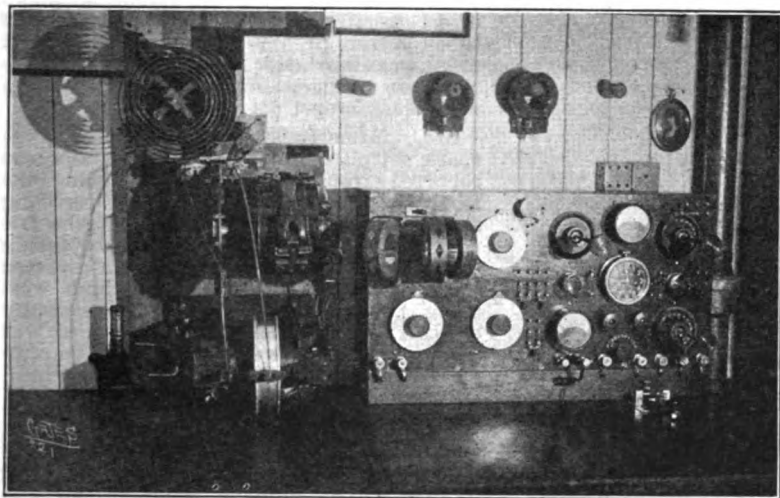
For telephone work this set employs Heising modulation with a 5-watt voice amplifier using 300-volts on the plate. This reduced voltage is secured from the main

It is found that much higher efficiency can be obtained by carefully adjusting the filament voltage of each tube separately. The whole set is very rigidly constructed of angle iron and asbestos wood.

Mr. Hight prefers the Paragon RA-10 to all other receivers for traffic work. Because of ill health he has been hampered

in construction work but we hope he will be with us regularly with his big tube set which, from the preliminary tests, promises to do some wonderful DX this winter.

4BQ certainly ought to have a splendid chance of getting over to Europe in our Transatlantic Tests this coming December.

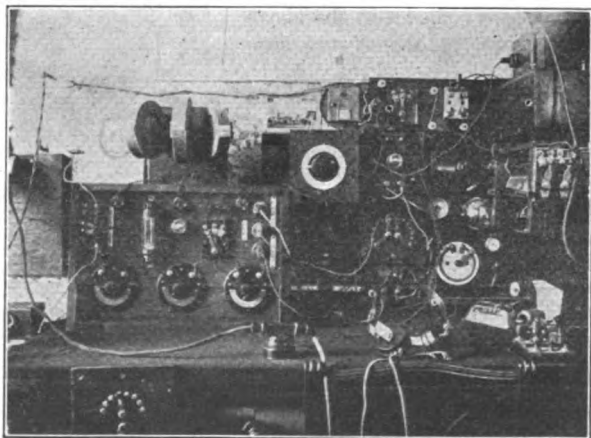


potential by the insertion of a series of high resistance rods varying from 50 to 80,000 ohms. The meter directly under the 5-watt tube reads up to 50 milliamperes and shows the current being drawn by the amplifying tube. The meter just above the triple-pole double-throw switch reads up to 3,000 volts for the plate circuit of the large tubes. The meter at the extreme top is a thermo-ammeter reading up to 15 amperes. Below this is a switch controlling the turns of the tickler coil, under which is the main plate milliammeter. The double-pole double-throw switch at the left bottom of the panel throws the plates from direct current to 500-cycle A.C. The triple-pole double-throw switch in the center of the lower panel is used to cut out the filter system and constant-current choke when the 500-cycle plate supply is used. The double-pole double-throw switch at the right switches the modulating circuit from buzzer to microphone or from one microphone to another. All meters have switches to cut them out or short circuit them for protection when C.W. or I.C.W. is used. Switches are also provided so that either tube can be operated separately for lower power. A separate small filament-lighting transformer is also used for the voice amplifier tube.

A Holland Station

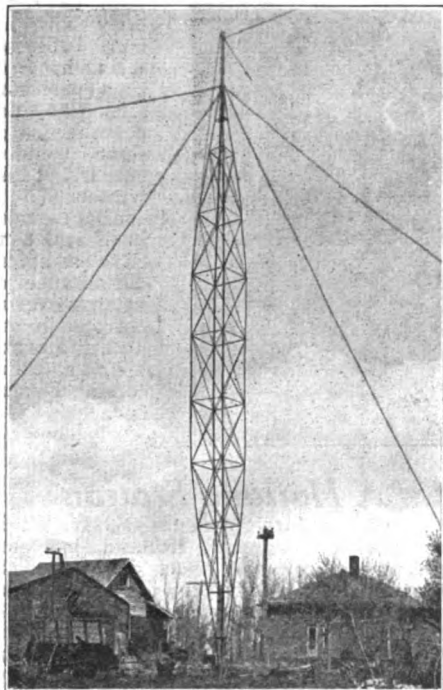
One of our foreign members, Mr. W. H. Moorrees of Dordrecht, Holland, has sent us a photograph and short description of his station which may prove of interest, although transmission by amateurs is strictly forbidden there.

The set consists of honeycomb coils and a one-step amplifier using Telefunken vacuum tubes. The phones and condensers look familiar. There is a set in the center designed for ship reception that works very nicely. To the right of this set may be



seen the one step amplifier and the aerial tuning inductance. The antenna is 165 ft. long, averaging 24-ft. high, and of two wires spaced 4 ft.

The long-wave set daily picks up NSS and phone from Chelmsford, England, and Paris, France, while the best record for the short wave set was made during the transatlantic tests when 1BCG was copied several nights.



8BO, Detroit

Remember in the story in the report on the "Governors-President Relay" how 8BO with a single 5-wattter grabbed the Montana and North Dakota messages from 9WU in Ellendale, N. D., on the last night, shot these msgs. with the one from Michigan direct to 4GL, and blew the only 5-watt tube on the premises just after the last msg. was finished? This historic tube is shown in the photo and is suitably done up with black crepe.

8BO formerly had a good high-grade spark set putting out $C\frac{1}{2}$ amperes and was reported from 40 states, 5ZA being the farthest west. The C.W. set has long superseded the old spark. All of the DX records were made with the one tube during the nine months it held up. It was reported QSA from 41 states, the farthest west being Loleta, Cal., and heard consistently at 6XAD. The most unusual record was made when 8ALU in Pittsburgh, Pa., reported the C.W. QSA on a crystal detector.

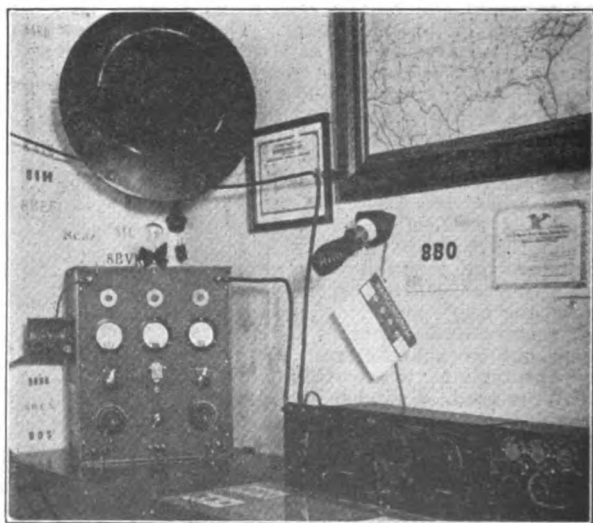
The "sure-fire" circuit is used with 600-volts of rectified A.C. and 135-milliamperes, putting out 1.7 "thermo-couple" amperes from one 5-watt tube. A Robertson-Detroit chopper is used giving a 500-cycle note and one ampere in the antenna. The chopper is used in series with the grid leak and passes about 45-milliamperes. No trouble is experienced raising stations with the chopper—especially spark—and all stations worked on the chopper are also raised with it. On average nights the range seems to be about $\frac{3}{4}$ of the range of the straight C.W. The best work on I.C.W. has been

(Concluded on page 68)

9AUU's Tower

The tower shown in the above photograph is one of the supports of the aerial at 9AUU, the station of Harry Long at Aneta, N. D. It has a total height of 75 feet, and was built before the War at a total cost of \$17.00.

At its base it is built up around an 8x8 fir timber, and at the top there is a 6x6 fir timber. The main construction is of $2 \times 2 \times \frac{1}{8}$ angle-iron, braced with 1-inch angle-iron. It is supported by four guys of $\frac{1}{2}$ -inch messenger cable.





British Columbia Radio Association

During the Vancouver exhibition the B. C. R. A. made things lively for the local boys by installing the equipment of 5BR at the show using the call letters 5GY. Messages for the Pacific Coast were accepted and relayed for the visitors. Dozens of new members were secured and many questions pertaining to radio were answered by the men in charge of the booth.

Atlanta Radio Club

New officers of the A. R. C. are: C. Bell, president; P. C. Bangs, 1st vice president; R. Le Crow, 2nd vice president; H. L. Reid, secretary; and P. Hook, treasurer. The club is a bureau of the chamber of commerce and meetings are held every other Wednesday evening at the town hall. Discussion is taking place to determine how the telegraphing amateur may operate his station before midnight since the broadcasting stations have monopolized the air the whole evening.

Egyptian Radio Bugs

In the Egyptian Radio Broadcaster appeared an announcement that the E. R. B. was affiliated with the A.R.R.L. Probably this came about because the E. R. B. had filed application for affiliation and was under the impression that they could use the name of the A.R.R.L. Upon calling this to the attention of the editor of the Broadcaster such announcement was discontinued. The application is pending final action by our Board of Direction.

Cleveland Radio Association

At a recent meeting of the C. R. A. new officers were elected as follows: E. H. Poad, president; W. D. Bumstead, vice president; A. G. Peoples, recording secretary; F. Neubauer, financial secretary; H. H. Hurd, treasurer; E. I. Deighan, chairman of advisory committee; and F. M. Murphy, traffic manager. A radio show will be held in connection with the Electrical League later in the fall. Club meetings are held every second and fourth Friday in the new Public Hall. The C. R. A. conducts a radio page in two of the Sunday newspapers. The radio inspector has provided the traffic manager with notification blanks consisting of a blue notice for first failure to observe the traffic regulations, and a pink slip for the second offense which

means action by the radio inspector. This will eliminate the criticism that was heaped on Cleveland amateurs last year and the radio inspector promises whatever action is necessary to give Cleveland good clean operation. Up to this writing no one has received the "pink ticket."

Fourth District Convention

Having learned how to do it, the Fourth District will have a convention to be put over by its own members in February. It will be remembered that the Third District combined with the Fourth District last February and gave us one of the best conventions in amateur radio. Committees have been appointed to take charge of the convention. Charlotte, North Carolina will be the scene of the gathering and the tentative program is given herewith. We want to see every "ham" this side of the Rockies turn out for the affair.

FOURTH DISTRICT RADIO CONVENTION TO BE HELD AT CHARLOTTE, NORTH CAROLINA OFFICERS

Chairman: F. A. Hill, 4GL, 1223 East Duffy St., Savannah, Ga.
Sec'y. & Treas.: John E. Hodge, 4BY, 143 Bull St., Savannah, Ga.
Entertainments, Hotels & Trans.: Fred Laxton, 4XD, Charlotte, N. C.; F. L. Bunker, 4CE, Charlotte, N. C.
Welcome: J. H. Robertson, 4ID, Box No. 8, Salisbury, N. C.
Publicity: B. W. Benning, 4XC, 50 Whiteford Ave., Atlanta, Ga.; W. B. Pope, 4AG, 197 Dearing St., Athens, Ga.
Technical: H. E. Bussey, 4AI, Gen. Electric Co., Atlanta, Ga.; A. J. Funk, 4XB, Savannah High School, Savannah, Ga. One other member to be selected by Chairman.
Exhibits: John Fox, 4EU, Travis Ave., Charlotte, N. C.
Stunts and Contests: W. T. Gravely, 3BZ, Gravely Bros., Danville, Va.

STATE CHAIRMEN

Georgia: W. B. Pope, 4AG, 197 Dearing St., Athens, Ga.
Alabama: V. C. McIlvaine, 5XA, Auburn Polytechnic Inst., Auburn, Ala.
Florida: L. W. McClung, 4BF, 1601 Bonnevista, St. Petersburg, Fla.
No. Carolina: Jimmy Morehead, 4CC, 215 Eugene Ave., Greensboro, N. C.
Virginia: Allen Clark, 3AEV, Danville, Va.
Tennessee: W. C. Hutcheson, 5DA, Wind Rock, Tenn.
So. Carolina: George Wrigley, 4HR, 311 E. Park Ave., Greenville, S. C.
Maryland: E. R. Bateman, 3APT, 1217 W. Lafayette Ave., Baltimore, Md.

TENTATIVE PROGRAM

February—some date—not to infringe on 3rd Dist. Convention.

(Concluded on page 68)

Strays



In connection with the reports of the Second Trans-Atlantic Tests last winter several mentions have been made of radio phone stations WQL and WQM which were heard by British amateurs. As previously announced, the Department of Commerce advise that these call letters were not assigned to active radio phone stations. Mr. Philip R. Coursey, who managed the British arrangements in these tests, however, is insistent that there is no room for mistake in the reports made, since many different amateurs in different parts of the British Isles sent in separate reports thereupon. Some had heard only one side of the conversation while others reported hearing the two talking together. We can only conclude that the call letters were used without authority by some unknown stations.

And now some enterprising firm has brought out a cotton clothes-line which has a stranded copper center concealed within it, for use on the roofs of landlords who object to antennas. Even a few clothes may be flown on it for disguise.

Has anyone had any difficulty in making tubes oscillate in parallel because the length of the circuit leads varied for each tube? It is often an important point and we would especially like to know if anyone has had this trouble. In one case at hand, three tubes were being paralleled and the grid-circuit wire was run to first one grid, then another, and finally to the third. Oscillations were obtained with great difficulty, efficiency was low, and grid current abnormal. Then separate grid wires were provided for each tube and bunched to the circuit lead so as to provide the same length of path to all grids. With no further changes the antenna current was tripled and the tubes oscillated readily with cool plates. The plate leads were similarly treated and a slight additional increase obtained.

Filament circuits should be carefully arranged too, but here more particularly in order that the voltage drop may be the same across each filament.

Dog-gone this fellow Reinartz; he keeps bringing out better tuners faster than we can make them.

An epidemic of these "endless-chain" prayers and good-luck letters has hit amateur radio, promising no burnt-out tubes all winter if the recipient will QSR a copy to nine other people but threatening dire calamity if ignored. These things are an awful nuisance, a relic of the days of witchcraft and black superstition, and they throw a burden of millions of extra letters on an already-groaning postal service. Let's keep them out of amateur radio, fellows. Ignore them; we have enough troubles already.

5ZO, Cliff Vick, of Houston, has taken unto himself a bride, and has hearty congratulations and best wishes from the gang.

Mr. Harvey Mitchell Anthony, A.R.R.L. Director and old time amateur, was married on August ninth to Miss Ruth Emerson Leffler. We wonder if this was the result of the write-up in "Who's Who" which appeared in the August number? If so, it's fast work, we'll say, but we wish them all the luck in the world anyhow.

At the recent Pageant of Progress Exposition in Chicago Mr. T. R. McElroy again held his own in the speed contest against three other speed demons. Although he did not copy faster than his previous record of 56½ words per minute, he grabbed off 55-1/10 words per minute perfect copy, which was considered by a committee to be better than his previous record which had four errors.

Radio Exams. in Fourth District.

Radio Inspector Van Nostrand informs us that examinations will be given in the Fourth District according to the following schedule: Florida—Tampa, Sept. 29; Sanford, Oct. 2; Jacksonville, Oct. 4; Georgia—Savannah, Oct. 9; Macon, Oct. 12; Atlanta, Oct. 14 (amateur only); Oct. 16 (commercial only); South Carolina—Greenville, Oct. 21; Columbia, Oct. 24; Charlestown, Oct. 27; North Carolina—Wilmington, Oct. 31; Raleigh, Nov. 2.

From the Radio Globe: "Radio Editor:—I have an Aeriola, Jr., receiver for hearing the music and one of my friends tells me that the wave lengths of this receiver only

last three months, when they will have to be renewed. Please tell me where can I buy wave lengths and what are the best kind to buy?" Maybe some of the gang in Iowa have some extra ones.

It is rumored that Hamo Wright, the gink with the magnetic fingers, has gone in partnership with C.W. Duzzit, the mesco buzzer chauffeur, and renew burnt out tubes by filling them with lightning bugs. To us it looks like the QRN would be fierce!

3JX came home a few nights ago and proceeded to listen in but on hearing no signals lifted the top of his new receiving set and was greeted by a mass of copper drippings, burnt coils, over-roasted spaghetti, and other reminders of last year's furnace. He promptly spit on the cat and started figuring on a new set but this time he probably will fuse the storage battery circuit.

Wouldn't it be Wonderful—

If tomato cans were made of phosphor bronze?

If friend A. L. Groves would drop in on us some night when we're having trouble with our three-coil circuit?

If every ham knew the difference between 200 and 360 meters?

If second-hand spark equipment was really worth as much as some birds still think it is? (From a CW ham.)

If 5FT were audible everywhere 4 ft. from the phones?

The American Radio Relay League has two new competitors. 5ABA traced a money order and found it being held for the "Mexican Radio Relay League." The hottest one to reach us bore the address of the "American Radiator Relay League." Golly, but its hard enough moving msgs. in this hot weather without being asked to deliver radiators all over the country.

Which reminds us of a radio engineer who used a radiator for a ground at his home but on putting in a transmitter was in doubt about the aerial and ground connections, not knowing which was the best radiator.

8BCL (a broadcast listener?) has discovered a prohibition grid leak. He used two small wires in a glass of water and gets much more antenna current than without.

Hon. R. B. Howell, a member of Secretary Hoover's recent radio-telephony conference, has been nominated as Republican candidate for senator in the Nebraska primaries. Mr. Howell is an exponent of public ownership, a reformer with the courage of his convictions, a representative of the people, and possessed of very firm

views on radio. Mr. Howell, if elected, will be an important factor in the radio deliberations of the Senate.

The personnel of the office of the First District Radio Inspector has been increased and additional funds placed at his disposal, enabling a much better covering of the district this coming year. The same improvement we trust is occurring in the other districts.

When pipes driven in the ground are used for an earth connection is frequently made to them by filling the end of the pipe with lead or solder. Such metals contract when cold, however, and it has been suggested that linotype metal be used, which will expand on cooling and make a tight joint. This can be obtained from most printers for about ten cents a pound.

Regarding the problem of when to use a by-pass condenser in a C.W. set and when not to, the general rule is that when the power supply comes in series with the tube and the inductance—a by-pass condenser should be put across the supply, but when parallel supply is used, bridged across from plate to filament, the by-pass condenser should be omitted, else it will permit the r.f. oscillations to leak by instead of going thru the inductance. In fact the condensers in the filter will permit this improper by-passing, and it should be eliminated in the case of parallel supply by inserting a radio-frequency choke in the supply lead near the plate.

Speaking of low wave lengths, one bug in Hartford reports waves as low as 50 micro-centimeters in his C.W. set. This happens every time he lights the tubes. As the proposed new law will not allow amateurs to use waves below 150 meters he is afraid he cannot light his tubes.

Most people use an individual rheostat on each tube and when the battery voltage changes slightly or when first listening in they adjust each rheostat. J. H. Miller suggests a master rheostat in the battery circuit. After the proportion of current in each tube is correctly adjusted only the master rheostat is shifted to take care of battery voltage variations.

Why do we go to great pains and considerable expense to get the very best insulating material for the panel of a set and then put sheet metal behind it as a capacity shield? Someone has asked why not use metal panels in the first place, with insulating bushings of hard fibre for control shafts, with binding posts on the rear of the cabinet and with switches sub-mounted on small insulating panels inside the cabinet? In fact the insulating bushings are not often necessary, as a large

hole may be drilled in the metal panel thru which a shaft for a condenser, etc., will pass freely with no need for support at the panel.

This is something to think about. We have seen such a set with an aluminum panel having a crackled black enamel finish and it really looks very handsome as well as providing excellent shielding from hand capacity.

If there is any chance of Marconi's reflected short wave transmission system making broadcasting any more secret, we're heartily in favor of it.

Rumors are thick these days of new R.C.A. tubes. We hear that a new model detector tube is being tested now at Radio Central, where heretofore 5-watt U.V.202's have been used altogether for reception. Marconi and a few select other guests inspected the new tubes but when questioned later about them said "they must remain quiet."

Neither does QST intend to be an amateur magazine in summer and a broadcast magazine in winter.

As a consequence of the demand for performance tests on radio receiving sets by non-technical dealers, the Bureau of Standards has drawn up an outline of tests which are to be carried out by the Electrical Testing Laboratories of New York in co-operation with the National Retail Dry Goods Assn. The tests are most comprehensive.

In place of a spark coil set for local work it seems that a key in the ground lead of the receiving set works f.b. and at the same time furnishes one of the best break-in systems. The coupling to the aerial circuit should be as close as possible up to the point where the oscillations stop. If an amplifier tube is used in place of the detector tube and more plate battery added the range may be increased several miles. The wave must be kept below 200 meters and the station licensed. Some of the owners of "broadcast receivers" getting bitten by the amateur bug may find this a convenient and surely inexpensive way to start in the ham game.

SBO, DETROIT, MICH.

(Concluded from page 64)

to 1XZ, 4FT, and 9AOG. Recently the power has been increased by the addition of another tube but no better distance has been covered.

Due to the antenna being walled in on the north and west by a row of trees and on the south and east by buildings, a satisfactory picture of the antenna system could

not be obtained. The antenna is a 6-wire inverted L, 45 ft. long, 66 ft. high at the lead-in end and 45 ft. high at the free end. The ground system consists of a buried counterpoise, driven pipe, and the city water system. The counterpoise consists of nine wires 80 ft. long, under the middle portion of the flat top. It being impossible to extend the counterpoise any farther at either end, a loading coil is used in the counterpoise lead.

The receiver consists of one of the first Grebe CR-3 receivers and is used with two steps of audio amplification.

HYDROMETER READINGS

(Concluded from page 61)

of water and acid around the plates and insulators takes considerable time and a correct reading cannot be obtained until total diffusion has taken place. The important thing to remember is, *use the hydrometer regularly and avoid total discharge of the battery.*

B. P.

WITH THE AFFILIATED CLUBS

(Concluded from page 65)

Thursday Noon—Assembly of delegates—Auto rides.
Thursday Night 8:30 P. M.—Informal meeting of delegates—"gabfest."
Friday, 10:00 A. M.—Convention opens—runs until Midnight.
Saturday, 10:00 A. M.—Final Convention Session.
Saturday Night—Banquet.

Houston Radio Club

An agreement with broadcast stations has been reached whereby broadcasting is given free air from 7:00 P.M. to 7:15 P.M. and from 8:00 P.M. to 10:00 P.M. Local amateur transmission is permitted until 10:00 P.M. providing it does not QRM the broadcasting. Outside of the hours 7:00 P.M. to 10:00 P.M. amateur traffic will be handled exclusively.

New England Radio Executive Council

The Boston Radio Executive Council has been changed to the New England Radio Executive Council with H. W. Castner, chairman, 727 Boylston St., Boston, Mass.

The annual New England Convention for 1922 will be held in connection with the coming radio exhibition in Boston. Amateur Day will be set aside the last day of the exhibition. Tickets will be sold only to A.R.R.L. members according to the present plan. Of interest to all relay men will be a traffic meeting and banquet in addition to other events of interest.

Next Month in QST

we will present the winning article in our contest for the best adaption of Armstrong Super-Regeneration to the requirements of A.R.R.L. relaying. Some real dope, O.M.—don't miss it.

Calls Heard



HEARD DURING AUGUST Unless Otherwise Specified

3JE, Toronto, Can.

C.W.: 1ANQ, 1AWB, 1BKQ, 1GV, 2AWF, 2AYZ, 2BLP, 2CBG, 2BNZ, 2KL, 2OM, 2RM, 2ALN, 2AQR, 2BLF, 2BJY, 2BZ, 2CC, 2SM, 2TJ, 2IW, 4RX, 4EA, 4NK, 4ZO, 5ES, 5HX, 5AGR, 5AMD, 5APT, 5ATU, 5BFX, 5BPL, 5BRC, 5CGX, 5CKO, 5CDZ, 5DA, 5FT, 5KG, 5UE, 5ZZ, 5APS, 5ADX, 5BS, 5BRL, 5BSG, 5DFB, 5DKY, 5XL.

Spark: 3HJ, 8ZO, 8UC, 9ZN.

9BD, Barron Hotel, Vancouver, B. C. (1 tube)

C.W.: 5QI, 5JL, 6AAT, 6AWT, 6ASJ, 6APW, 6ABX, 6AK, 6BA, 6BUM, 6FH, 6GR, 6FT, 6KA, 6KU, 6GH, 6NX, 6BES, 6BOE, 6BCJ, 6ZX, 6ZF, 7AGF, 7AEA, 7IY, 7OE, 7MF, 7IU, 7NA, 7SC, 7TW, 7QW, 7OZ, 7WM, 7ZB, 7BT, 7YR, 7AXR, 9AMB, 9AU, 9NC, 9PI, 9DA, 9ZAF, Can. 4BV, 5CT.

Spark: 6ANG, 6GR, 6AMZ, 6IC, 6VX, 6TU, 7BB, 7BK, 7AEA, 7VE, 7KJ, 7KM, 7VX, 7TO, 7ZK.

Can. 3HE, Kingston, Ont.

1ASC, 1AIQ, 1AGF, 1AJF, 1BKQ, 1BES, 1BGF, 1CMK, 1CPN, 1FB, 1UH, 2AWF, 2AFP, 2ACT, 2ANM, 2BMR, 2BKQ, 2BG, 2CBG, 2CGJ, 2CC, 2FF, 2HU, 2KL, 2TS, 2VA, 2ANO, 2BJO, 2BJY, 2BNU, 2BLF, 2CBM, 2CG, 2GW, 2LP, 2LR, 2MK, 2SM, 2TJ, 2TN, 2VW, 2XW, 2YF, 2ZO, 4AU, 4BX, 4BQ, 4EH, 4GK, 4MW, 5FV, 5AQO, 5AB, 5AMZ, 5AN, 5AIX, 5APT, 5AWP, 5ATU, 5AFD, 5AVR, 5ASZ, 5BEF, 5BPM, 5BJY, 5BPH, 5BDB, 5BJU, 5BRW, 5BSO, 5BRF, 5BWA, 5BFH, 5BDY, 5BFX, 5BDO, 5CCX, 5YQSA, 5CLL, 5CGQ, 5CJY, 5CAK, 5CPX, 5CGN, 5CEI, 5CUV, 5HJ, 5KG, 5IFY, 5IFD, 5NV, 5SB, 5SL, 5UE, 5UK, 5ZQ, 5ZZ, 5AAP, 5AJA, 5AON, 5AQM, 5AXF, 5AWF, 5APS, 5AJH, 5BGH, 5BCF, 5BJV, 5BRL, 5CJA, 5DUY, 5DOP, 5H, 5US, 9XL, Can. 3CZ, 3KO, 3NE, 9AL.

1ES, Brookline, Mass.

Spark: (1CDM), 2AAF, 2AHU, (2ARY), (2BSC), 2CT, 2DN, 2FF, 2NF, 2OM, 2XAJ, 2AHK, 2HJ, 2QN, 2AXN, 2BDA, 2BO, 2IL, 2UC, 2ZO, 2ZN.

C.W.: (1ABS), 1ACS, 1ACU, (1AGI), 1AIC, (1AJP), (1ANQ), 1ATJ, (1AWB), 1AZW, (1BAS), 1BDI, (1BDV), 1BES, (1BKQ), 1BLN, 1BSZ, (1CEC), 1CHJ, 1CLW, (1CMK), (1CMP), (1CPN), 1CPO, (1FB), (1GV), 1HK, (1ON), 1PY, (2ACT), 2ACY, 2ADL, (2AFP), 2AJA, (2ANM), 2AQH, (2AUZ), 2AWF, 2AWH, 2AYF, 2AYZ, 2BDG, (2BGI), (2BGW), 2BML, 2BMR, (2BNZ), (2BQD), 2BQH, 2BQU, (2BRB), (2BRC), (2BUM), (2CBG), (2CBW), 2CRY, (2CCA), 2CES, 2CGJ, 2CKZ, 2FF, 2GK, 2HW, (2IG), 2KL, 2NF, 2NZ, (2RM), 2TS, (2UD), (2VA), 2VH, (2XAJ), 2ADY, 2AEV, (2AFB), 2AGN, 2AHK, 2AIS, 2ALN, 2ANJ, 2ANO, 2APR, 2AQR, 2ATF, 2ATZ, (2AWH), 2BGT, 2BHM, 2BIT, (2BJY), 2BLF, (2BNU), 2BOB, 2BUP, 2BZ, (2CAN), (2CBM), 2CC, (2CDK), 2CG, (2DT), (2FS), 2GP, 2HD, 2IL, 2IW, 2KD, 2KG, 2LP, 2LR, 2MK, 2QV, 2SM, 2TN, 2VW, (2WF), 2ZO, 2ZW, 4DC, 4EA, 4EY, 4GH, 4HW, 4LP, 4MW, 4NT, 5FV, 5QI, 5AB, 5ACF, 5ACH, 5ADH, 5ADN, 5AEC, 5AFD, 5AFY, 5AGR, 5AIG, 5AIO, 5ALT, 5AMQ, 5AN, 5ANB, 5AND, 5AOB, 5APT, 5AQO, (5ARD), 5ASV, (5ASZ), (5ATU), (5AVD), (5AWT), 5AXN, 5BDB, 5BDO, (5BEF), (5BFH), 5BPM, 5BJC, 5BKE, (5BKH), 5BKN, 5BMM, 5BNJ, 5BO, 5BOZ, 5BPH, 5BPL, 5BQF.

5BRC, 5BRM, (5BRT), 5BRW, 5BSJ, 5BSS, 5BVR, (5BVT), (5BWA), 5BZJ, 5CAU, 5CDZ, 5CEF, 5CGN, 5CJH, 5CJY, 5CKO, 5CLI, 5CLW, 5CMI, 5CNW, 5CON, (5CPX), 5CUR, (5CUV), 5CYT, 5EH, 5FT, 5HH, 5HJ, 5KG, 5KH, (5ND), 5NV, 5OW, 5PD, 5PT, (5QB), 5SB, 5SE, 5SL, 5UE, 5UK, 5VY, 5WA, 5WI, 5WR, 5XE, 5ZAE, 5ZN, 5ZQ, 5ZZ, 5AAP, 5AJH, 5ALW, 5AON, 5AOU, 5APS, 5AXF, 5AWF, 5BAA, 5BLC, 5BRL, 5BZ, 5CBA, 5CJA, 5DEK, 5DGG, 5DTJ, 5DUG, 5EI, 5HW, 5H, 5LZ, 5OX, 5UC, 5UH, 5WC, 5XL, Canadians (3JI), 3JK, 3KO.

1BJS, Nobleboro, Me.

Spark: 1AA, (1ACO), (1ADC), 1AMD, (1AMQ), 1APT, 1AXD, 1AZK, 1BDT, 1BDV, 1BJN, 1BOE, 1BPF, (1BPZ), 1BRL, (1BRQ), 1BUB, 1BVE, (1BVG), 1BZN, 1CE, 1CED, 1CDN, 1CHG, 1CK, 1CKL, 1CPJ, 1DY, 1EZ, 1FB, (1FS), 1GW, 1HO, (1LZ), 1OE, 1OR, 1SC, 1SE, 1SN, 1TS, 1XM, 2AAF, 2ACW, 2AD, 2AER, 2AHU, 2ARY, 2AWF, 2AX, 2BER, 2BJG, 2BPF, 2DN, 2EL, 2FF, 2JG, 2MN, 2NF, 2OM, 2RM, 2SQ, 2ACV, 2AHK, 2AJD, 2AXN, 2AXQ, 2FS, 2UC, 2XE, Canadian 9BS.

C.W.: 1ABS, 1ACU, 1ADN, 1ADR, 1AG, 1AGH, 1AGI, 1AHZ, 1AJO, 1AJU, 1ANQ, 1AR, 1ASF, 1AUN, 1AWB, 1AWO, 1AZD, 1AZW, (1BAS), 1BBM, 1BCF, 1BDS, 1BDU, 1BDV, 1BEC, 1BES, 1BGT, 1BHR, 1BKA, 1BQ, 1BNT, 1BQ, 1BVR, 1CBH, 1CCZ, 1CDO, 1CFI, 1CHJ, 1CJH, 1CK, 1CKE, 1CLZ, 1CMK, 1CMP, 1CNE, 1CNR, 1COT, 1CPN, 1FB, 1GV, 1HK, 1HX, 1IV, 1JT, 1KC, 1PT, 1QN, 1QP, 1RD, 1SC, 1SD, (1UL), 1UJ, (1VT), 1XM, 1XX, 1YK, 1DFI, 2ANM, 2AWF, 2AWH, 2AWS, 2BDG, 2BML, 2BQU, 2CBC, 2CBG, 2CDR, 2CES, 2CNZ, 2DA, 2FF, 2GK, 2HW, 2NZ, 2TS, 2UD, 2XAJ, 2YF, 2ZK, 2BNU, 2BRW, 2BZ, 2CC, 2FS, 2HJ, 2IJ, 2IL, 2OT, 2VW, 2WF, 2XW, 2YF, 2EA, 2AB, 2ACF, 2ADN, 2AFD, 2AJH, 2ATI, 2BOE, 2CGN, 2CID, 2CJH, 2FT, 2XE, 2ZZ.

1SC, Scituate, Mass. (18 inch loop on Aug. 27)

Spark: 1CM, 1DY, 1OR, 1AAE, 1ACO, 1ADC, 1AKG, 2AX, 2FP, 2NF, 2OM, 2AJE, 2BG, 2OK, 2RW, 2ACY, 2ARM, 2BEI, 2AJT, 2BDA, 2BVN.

C.W.: 1CK, 1ES, 1FB, 1GV, 1SD, 1UH, 1AAW, 1ACU, 1ADC, 1AGI, 1AGK, 1AJU, 1ANT, 1ASJ, 1AWF, 1AZL, 1BCF, 1BGF, 1BKQ, 1BNT, 1BQ, 1BWJ, 1CDO, 1CHJ, 1CKE, 1CNE, 1CPO, 1CSO, 2AS, 2BG, 2FF, 2FP, 2FZ, 2HW, 2KL, 2PQ, 2RM, 2VA, 2AEQ, 2ANM, 2AWF, 2AYF, 2AZZ, 2BDW, 2BQD, 2BQU, 2BRB, 2BRC, 2BTW, 2BUM, 2CBG, 2CBW, 2CGJ, 2CKU, 2CPD, 2BA, 2BD, 2BZ, 2CC, 2DT, 2FS, 2KD, 2MO, 2MK, 2TS, 2TO, 2VW, 2ALN, 2APR, 2AWF, 2BUT, 2BVG, 2BZ, 2BJY, 2BNU, 2BSJ, 2BUT, 2BVG, 2CDE, 2BZ, 2EA, 2FT, 2GH, 2GX, 2LP, 2DO, 2FX, 2AG, 2BN, 2DV, 2EH, 2FT, 2HJ, 2OW, 2SB, 2SF, 2SL, 2UE, 2UO, 2VY, 2WR, 2ZW, 2ACF, 2ADH, 2ADT, 2AFD, 2AFI, 2AFN, 2AIF, 2ALT, 2APT, (2ASZ), 2BDB, 2BEF, 2BEX, (2BFM), 2BFX, 2BJC, 2BJV, 2BKE, 2BKN, 2BPI, 2BRQ, 2BRT, 2BSH, 2BSS, 2BTR, 2BUR, 2BVT, 2BXH, 2CAK, 2CAY, 2CDX, 2CEF, 2CJH, 2CJY, 2CON, 2ZAE, 2CV, 2H, 2KR, 2XL, 2AON, 2APW, 2ARZ, 2ASZ, 2AXF, 2BCF, 2BCT, 2BJV, 2CJA, 2CJZ, 2DAE, 2DFB, 2DPL, 2DTJ, 2YAJ, 2ZAF, Can. 3JI, (3JK), 9AL.

1QS, Bridgeport, Conn. (1 tube)

Spark: 1AA, 1AZK, 1AOK, 1ADC, 1AMQ, 1BJS, 1BVB, 1CHQ, 1CHX, 1CK, 1FS, 1LZ, 2AAF, 2AFD, 2AD, 2EL, 2DN, 2OM, 2QN, 2RM, 2FF, 2NF, 2NP, 2GE, 2FP, 2HJ, 2RW, 2BEI, 2BUC, 2ANW, 2AYM, 2AXN, 2DC, 2ZO, 2HG, 2KG, 2EW, 2BDA, 2TC, 2UC, 2CP, 2UH, 2ZN.

C.W.: 1AAP, 1ABS, 1AHZ, 1AIQ, 1AJU, 1AJL, 1ANQ, 1AOL, 1AWB, 1ATJ, 1AZW, 1BKQ, 1BDV, 1BTR, 1BNT, 1BGF, 1BES, 1CCZ, 1CNE, 1CEC, 1COT, 1CQW, 1CMK, 1CMP, 1ES, 1CK, 1FS, 1FB, 1IL, 1IL, 1EH, 1FQ, 1SD, 1VQ, 1XM, 1QN, 1XP, 1VT, 1RD, 1GV, 2AWF, 2AVE, 2AYF, 2ANM, 2ACT, 2AFP, 2AYZ, 2AGA, 2BQH, 2BML, 2BNL, 2BRC, 2BQU, 2BGI, 2BDG, 2BUM, 2BGM, 2CBG, 2CCK, 2CBC, 2KL, 2BG, 2HW, 2FP, 2CC, 2NZ, 2EH, 2RM, 2VV, 2TS, 3ATJ, 3AJO, 3ANO, 3AIP, 3AFP, 3AWH, 3ADZ, 3ALN, 3BMT, 3BLF, 3BJY, 3BVL, 3BNU, 3BRW, 3BJ, 3BSP, 3BUC, 3BUP, 3BVA, 3BFG, 3BUY, 3BVC, 3MK, 3BF, 3KO, 3FS, 3WF, 3VW, 3LP, 3BZ, 3LR, 3DT, 3SM, 4DC, 4EA, 4EX, 4MW, 4MK, 4NT, 4LP, 4NV, 4BY, 4TI, 5AAM, 5AQO fone, 5ASM, 5AFD, 5ALD, 5AWP fone, 5AVY, 5APT, 5AMM, 5APH, 5ARD, 5AND, 5ASV, 5ASZ, 5ALT, 5AFV, 5AVL, 5ADH, 5BDA, 5BMK, 5BWA, 5BJV, 5BPH, 5BDU, 5BVT, 5BRM, 5BNJ, 5BCF, 5BET, 5BJS, 5BEF, 5BDO, 5BWC, 5BFM, 5BGV, 5BKE, 5BPH, 5CQX, 5CGX, 5CBC, 5CAZ, 5CID, 5CDZ, 5CJY, 5CUU, 5CKM, 5CPX, 5CGN, 5CCX, 5DAK, 5ZAE, 5ZAG, 5AB, 5AN, 5CF, 5KG, 5UZ, 5XE, 5HJ, 5SB, 5RC, 5LG, 5QD, 5UE, 5FT, 5JY, 5YD, 5SC, 5EA, 5QB, 5JD, 5WI, 5UK, 5ZO, 5ZT, 5AAP, 5AWF, 5APW, 5AJH, 5AJP, 5AMI, 5DFB, 5DTJ, 5EI, 5LQ, 5NU, 5OX, 5LZ.

1ABS, North Perry, Maine

C.W.: 1AAO, 1ACU, 1AGI, 1AIG, 1AJL, 1AJP, 1AJU, 1AKG, 1ARG, 1ASF, 1AZL, 1AZW, 1BAS, 1BDI, 1BDV, 1BES, 1BLN, 1BNT, 1BRQ, 1CDO, 1CDP, 1CEC, 1CFI, 1CHJ, 1CKE fone, 1CMK, 1CMP, 1CNE, 1CNR, 1CPO, 1CPN, 1CQW, 1CSO, 1SR, 1ES, 1FX, 1GV, 1HK, 1IL, 1IL, 1SD, 1SK, 1SQ, 1SV, 1KG, 1LE, 1VT, 2ACD, 2ADL, 2AGC, 2AJW, 2ANM, 2AVZ, 2AVE, 2AVH, 2AWF, 2AWH, 2BGM, 2BMR, 2CBG, 2CGJ, 2BG, 2FP, 2GK, 2HW, 2KL, 2LP, 2LT, 2NZ, 2RM, 2RY, 2TS, 2VA, 2UD, 2AA, 2ADZ, 2ALN, 2BIT, 2BJY, 2BJW, 2BNU, 2BTT, 2CAN, 2CBM, 2CDK, 2CRJ, 2FR, 2IW, 2MK, 2TJ, 2TN, 2VW, 2XW fone, 2ZO, 2ZW, 2BX, 2NT, 2QH, 2AOB, 2APT, 2AQO fone, 2ATU, 2AVL, 2BDV, 2BEF, 2BFM, 2BIP, 2BJ, 2BNJ, 2BNU, 2BRQ, 2BSS, 2BUA, 2BUR, 2BUV, 2BFX, 2CID, 2CJH, 2CKO, 2COL, 2CUU, 2CUV, 2FP, 2SB, 2SL, 2YV, 2WR, 2ZQ, 2ZZ, 2AJA, 2AVF, 2AUZ, 2AWF, 2BHD, 2DTJ, 2Cans, 1AL, 9AL.

Spark: 1ACO, 1BJS, 1GM, 2BY, 2OM, 9ZN.

2CAD and 2ACY, Bayonne, N. J. (1 Tube)

C.W.: 1ES, 1FW, 1GV, 1RH, 1SD, 1XM, 1ACU, 1AGF, 1AGH, 1AGI, 1AJO, 1AJU, 1ANG, 1AWB, 1AWZ, 1BDI, 1BES, 1BKQ, 1BQK, 1BVA, 1BYN, 1CEC, 1CHJ, 1CMK, 1CNE, 1CPN, 2HW, 2ANM, 2AWF, 2CGJ, 3BZ, 3CC, 3DT, 3FS, 3IR, 3IW, 3LP, 3LR, 3MK, 3OT, 3ZO, 3VW, 3AAO, 3AFB, 3VW, 3AAE, 3AFB, 3ALM, 3AQR, 3BLF, 3BNV, 3BRF, 3GDK, 4BF, 4BX, 4EA, 4GL, 4GO, 4NT, 5AB, 5EO, 5EK, 5FV, 5LJ, 5QI, 5EN, 5CN, 5EH, 5ET, 5HJ, 5JD, 5KG, 5KH, 5LT, 5OW, 5SB, 5SE, 5UC, 5VE, 5VG, 5VY, 5WI, 5WR, 5XJ, 5ZN, 5ZZ, 5AFD, 5AFY, 5ALT, 5AMD, 5AMQ, 5AOD, 5APT, 5AQF, 5AQO, 5ARD, 5ALV, 5AWB, 5AWZ, 5BDB, 5BDO, 5BDU, 5BEF, 5BFM, 5BFX, 5BOX, 5BRM, 5BRQ, 5BRW, 5BSS, 5CDZ, 5CEI, 5CFP, 5JY, 5CKM, 5CKO, 5CPX, 5CUR, 5DAK, 5ZAE, 5ZAG, 5CP, 5EI, 5HW, 5NU, 5OX, 5UH, 5UW, 5AIX, 5AJH, 5AWF, 5ALT, 5APR, 5APS, 5AXF, 5BED, 5BLC, 5BSG, 5BSO, 5BYA, 5DFB, 5DSM, 5CBA, 5CJA.

Spark: 3HJ, 9CP, 9UH, 9ZN.

2CJX, Ridgefield Park, N. J.

Spark: 1AKG, 1AMD, 1BGF, 1BPZ, 1BVH, 1BVS, 1CHJ, 1CHQ, 1CMK, 1CNI, 1DY, 1GM, 1ILZ, 1OJ, 2BY, 2APB, 3ACY, 3RW, 3AEQ, 3AIB, 3APB, 3AQO, 3ARD, 3AVJ, 3AXN, 3BDA, 3BQA, 3DY, 3RL, 3RQ, 3TC, 3TT, 3UC, 3VQ, 3ZD, 3AFO, 3ARK, 3DZ, 9ZN.

C.W.: 1AAO, 1ABS, 1AJP, 1AKG, 1AZW, 1BAS, 1BCF, 1BDI, 1BES, 1BKQ, 1BNT, 1BQT, 1BSP, 1CCZ, 1CDT, 1CFI, 1CGZ, 1CHJ, 1CLT, 1COL, 1CPN, 1FB, 1HK, 1HX, 1JG, 1PY, 1RD, 1TT, 1UH, 1XX, 1YK, 3AAW, 3AFB, 3ALN,

3ATZ, 3AUU, 3AWH, 3AYU, 3BG, 3BJ, 3BNU, 3BP, 3BVC, 3BZ, 3CG, 3JJ, 3MK, 3OT, 3OW, 3TJ, 3VW, 3ZZ, 4AU, 4BB, 4BQ, 4DC, 4JK, 5UK, 5AB, 5ACF, 5ADH, 5AFD, 5AK, 5AMM, 5AMQ, 5AOL, 5APS, 5APT, 5AQO, 5ASM, 5ATU, 5AUL, 5AVD, 5BBD, 5BDU, 5BFM, 5BJS, 5BNU, 5BNY, 5BPS, 5BWA, 5CAF, 5CCX, 5CCZ, 5CDO, 5CEF, 5CGH, 5CID, 5CJH, 5CJM, 5CKO, 5COL, 5CTP, 5CUU, 5LJ, 5MW, 5NB, 5QB, 5SB, 5SF, 5UK, 5UZ, 5WR, 5XE, 5ZAF, 5ZAG, 5ZZ, 9AAF, 9ALD, 9AMI, 9HW, 9IO, 9VY.

2BWV, Richmond Hill, L. I.

C.W.: 1ES, 1FB, 1GV, 1HK, 1HX, 1IV, 1JT, 1PR, 1QN, 1RD, 1SC, 1SD, 1VT, 1XM, 1XP, 1ABY, 1ABS, 1ACS, 1ACU, 1AGH, 1AGI, 1AIP, 1AIQ, 1AJP (fone), 1AJU, 1AKG, 1AWB, 1AYZ, 1AZW, 1BAS, 1BCF, 1BDI, 1BES, 1BGF, 1BKQ, 1BNT, 1BQA, 1BQK, 1BQW, 1BVR, 1BWJ, 1CCZ, 1CEC, 1CFI, 1CHJ, 1CHW, 1CJA, 1CMK, 1CMP, 1CNE, 1CNR, 1CPN, 1CPO, 1CSO, 3AA, 3BZ, 3A, 3CC, 3DM, 3DT, 3FR, 3FS, 3HL, 3IK, 3IW, 3LP, 3LR, 3MK, 3OD, 3OT, 3RE, 3SM, 3TJ, 3TN, 3VS, 3VW, 3WF, 3ZM, 3AAO, 3AHK, 3AJB, 3AJD, 3AKA, 3ALN, 3ANJ, 3APE, 3AQR, 3ASY, 3ATZ, 3AWF, 3BGT, 3BHM, 3BJ, 3BIT, 3BJY, 3BLF, 3BNU, 3BUP, 3BVC, 3BVL, 4AU, 4CQ, 4DC, 4DS, 4EA, 4EB, 4EX, 4GH, 4GK, 4HW, 4KC, 4LP, 4MK, 4MW, 4NT, 4NV, 5DO, 5QI, 5ABM, 5AN, 5DV, 5EH, 5FT, 5HJ, 5KG, 5KH, 5LT, 5PD, 5QB, 5SB, 5SE, 5SL, 5SP, 5UC, 5UE, 5UK, 5WR, 5ZN, 5ZZ, 5ACF, 5ACO, 5ADN, 5AEC, 5AFD, 5AFY, 5AKP, 5ALD, 5AMD, 5AMM, 5AMQ, 5ANK, 5ANO, 5APH, 5APT, 5AQO, 5ARD, 5ASV, 5ASZ, 5ATU, 5AVL, 5AVF, 5BCF, 5BDB, 5BDU, 5BEF, 5BEK, 5BFH, 5BFM, 5BFX, 5BGV, 5BJC, 5BJS, 5BKE, 5BKM, 5BNU, 5BOX, 5BPL, 5BPH, 5BRC, 5BRM, 5BRQ, 5BRT, 5BSJ, 5BSS, 5BST, 5BTR, 5BVL, 5BVR, 5BVT, 5BWA, 5BXH, 5CAZ, 5CCX, 5CDZ, 5CEI, 5CFB, 5CGX, 5CID, 5CJH, 5CJY, 5CKM, 5CKO, 5CKX, 5CPX, 5CQX, 5ZAE, 5ZAG, 5AAP, 5AJA, 5AJP, 5AMI, 5AON, 5ARZ, 5AWF, 5BFC, 5BDB, 5BGH, 5BLC, 5BYA, 5CJA, 5CJJ, 5DEK, 5DSG, 5DTJ, 5HW, 5II, 5IQ, 5KR, 5LQ, 5Canadian 5KO, 9AL.

Spark: 1GM, 1AVA, 1BVV, 1CDM, 3ACY, 3AWF, 3BVC, 3EO, 3UC, 3APB, 3BDA, 3BRL, 9UH, 9ZN.

2TC at Pensacola, Fla.

C.W.: 2BEH, 4MW, 5DO, 5ES, 5HB, 5AFY, 5BKE, 5BSS, 5CDZ, 9BU, 9IO, 9OX, 9XZ, 9AJA, 9AON, 9AZA, 9BSG, 9CBA, 9DUG.

Spark: 4GM, 9UH.

3MB, Reading, Pa. (one tube)

Spark: 1AMD, 2OM, 3ABH, 3AGR, 3HJ, 3NF, 4BI, 5AIB, 5AJT, 5ANW, 5AYM, 5BDA, 5EO, 5RQ, 5TC, 9ZN.

C.W.: 1AIC, 1AJL, 1AWB, 1BK, 1BKQ, 1CKE, 1CPN, 1CHJ, 1FB, 1HK, 1QN, 1XP, 2AWF, 2AWH, 2AWZ, 2CBG, 2CCK, 2FP, 2RM, 2VA, 2WB, 3AA, 3AKL, 3ALN, 3AWH, 3BLF, 3BLR, 3BIT, 3BNU, 3BRW, 3BVA, 3BVC, 3BW, 3CA, 3CM, 3DM, 3CBM, 3FR, 3FS, 3IW, 3MK, 3TN, 3ZO, 4BG, 4DC, 4EA, 4EB, 4GH, 4HW, 4NV, 4AU, 4ASZ, 4AWM, 4AVL, 4AMZ, 4AFD, 4ARD, 4APT, 4ATU, 4AB, 4ABV, 4AMP, 4BDO, 4BOX, 4BFM, 4BHZ, 4BCF, 4BJS, 4BRW, 4BKE, 4BPL, 4BFX, 4BVA, 4BWA, 4CJH, 4CDZ, 4CGX, 4CKM, 4CPX, 4CTP, 4CGM, 4CEI, 4CD, 4CCX, 4CKO, 4FT, 4IFC, 4IFY, 4KG, 4OW, 4SB, 4SP, 4UK, 4VE, 4ZAG, 4ZZ, 9AAP, 9AJH, 9ARR, 9AXF, 9BDB, 9BEH, 9BFB, 9BSG, 9BYA, 9DTJ, 9EI, 9GI, 9IO, 9LQ, 9NU.

3ZO, Parkersburg, Pa.

C.W.: 1FB, 1GV, 1IL, 1SC, 1XM, 1ABS, 1AJP, 1ANQ, 1AWB, 1AZW, 1BBW, 1BKQ, 1CCZ, 1CGQ, 1CPO, 2BG, 2GK, 2HW, 2NZ, 2RM, 2RY, 2TS, 2UD, 2ZL, 2AFP, 2ANM, 2AUZ, 2AWE, 2BEG, 2BEH, 2BFZ, 2BIR, 2BQD, 2BRB, 2CHH, 3CCG, 3DM, 3FS, 3GK, 3JW, 3LP, 3MA, 3OT, 3QV, 3SM, 3VW, 3WF, 3AAO, 3AA, 3ABW, 3ADP, 3AD, 3ALN, 3ANJ, 3ATP, 3AVC, 3AWF, 3AWH, 3BEI, 3BIF, 3BIT, 3BLF, 3BMJ, 3BNU, 3BRW, 3BTY, 3BVA, 3CBM, 4BK, 4EA, 4NT, 8BC, 5BF, 5FT, 5HJ, 5KG, 5KH, 5NB, 5PD, 5PT, 5TC, 5UC, 5UE, 5XJ, 5YD,

(8ZN), 8ZR, (8ZZ), 8AER, 8AFD, 8AKP, 8AMQ, 8APT, 8AQO, 8ASV, 8ASZ, 8BDB, 8BEF, 8BFH, 8BPM, (8BFX), 8BEK, 8BPL, 8BRC, 8BRM, 8BSJ, 8BSS, 8BVR, 8BWA, 8BXH, 8CAU, 8CAZ, 9XL, 9AOU, 9ARR, 9AXF, 9BDH, 9BJV, 9BSG, 8CCX, 8CEF, 8CJA, 8CJH, 8ZAE, 9AP, 9FK, 9IO, 9XL, 9AOU, 9ARR, 9AXF, 9BHD, 9BJV, 9BSG.

3BGN and 3BIS, Cape May, N. J. (One Tube)

Spark: 1AW, 1GM, 2AD, 2ARB, 2FP, 2NF, 2OM, 3CN, 3CT, 8AQO.

C.W.: 1ACS, 1ACW, 1AGJ, 1AIQ, 1AJU, 1AJW, 1AKG, 1ANT, 1ANQ, 1ARJ, 1AWB, 1AWZ, 1AZO, 1BCF, 1BHH, 1BJW, 1BKO, 1BKQ, 1BTJ, 1BVA, 1CEC, 1CHI, 1CHO, 1CMK, 1CNR, 1CPN, 1CPR, 1CSO, 1GV, 1HK, 1HX, 1IV, 1PR, 1PY, 1SC, 1TS, 2ACF, 2AFP, 2AGC, 2AJW, 2AMP, 2AWF, 2AWZ, 2AYQ, 2BEH, 2BIR, 2BML, 2BMR, 2BQU, 2BRB, 2BTW, 2BUM, 2CCU, 2CH, 2CEH, 2CFE, 2CKL, 2GK, 2JW, 2KL, 2NF, 2RY, 2TH, 2TF, 2TS, 2AFB, 2AIS, 2AQR, 2AWF, 2AWH, 2AWM, 2AYF, 2BEB, 2BIJ, 2BLF, 2BML, 2BNU, 2BTY, 2BQU, 2BV, 2BVA, 2BVG, 2BZ, 2CC, 2CF, 2CN, 2CV, 2DT, 2FP, 2OT, 2QN, 2TJ, 2TM, 2TN, 2WF, 2ZO, 2ZW, 4BX, 4BY, 4EA, 4EL, 4NT, 4ACF, 4AQ, 4AQO, 4ASZ, 4ATU, 4AVL, 4AWM, 4AWZ, 4AXN, 4BCZ, 4BDB, 4BDU, 4BEF, 4BFM, 4BNU, 4BRT, 4BTJ, 4BUM, 4CID, 4HJ, 4MF, 4SB, 4SP, 4SL, 4UE, 4XE, 4ZQ, 4ZZ, 9ADH, 9AGI, 9AMI, 9ARS, 9AWP, 9BDH, 9BTJ, 9SM, 9WF.

4KF, Atlanta, Ga.

C.W.: 9AAN, 9AJH, 9APS, 9AFJ, 9BHI, 9BLC, 9BEL, 9SM, 9BWK, 9CFI, 9CKM, 9DFB, 9DKY, 9DZM, 9EI, 9FD, 9FN, 9GL, 9GZ, 9KEE, 9KJP, 9LQ, 9NU, 9XL, 9ABR, 9ANB, 9ASZ, 9AP, 9BDO, 9IFY, 9KY, 9YBK, 9XJ, 9ZP, 5AE, 5DA, 5DI, 5ES, 5HB, 5KP, 5LA, 5QI, 4BQ, 4BX, 4CR, 4HW, 4KE, 4NW, 4NI, 4OD, 3HJ.

4NT, Wilson, N. C.

C.W.: (1ABS), (1FB), (2AWF), 2BJO, (2BQU), (2CAN), (2CES), (2CFI), (2CBG), (3FS), (3MC), (3OD), (3TN), (3VW), (3ANJ), (3BIT), (3BLF), 3BOB, (3BVA), (3BVL), (3CAL), (4BX), (4DC), (4FT), (4JK), (4KC), (4GH), (4LT), (8FT), (8HT), (8UO), 8ZZ, (8AFD), (8DKE), 9APS.

5AR, Bay Minette, Ala.

Spark: 5BJ, 5MO, 5SM, 5TU, 5ZL, 8BDA, 9AZF, 9BED, 9BM, 9BMN, 9BGN, 9DMJ, 9DZY, 9IR, 9OK, 9SM, 9UE, 9US.

C.W.: 3BJ, 3BLF, 3IO, 3LP, 3LR, 3TJ, 4AIP, 4BQ, 4BX, 4DAI, 4DL, 4DS, 4EA, 4EB, 4GL, 4HW, 4ID, 4JY, 4KF, 4LP, 4MN, 4NEQ, 4NT, 5ADE, 5AE, 5DI, 5DO, 5DY, 5EK, 5ES, 5HK, 5KU, 5LA, 5LJ, 5NT, 5NV, 5PX, 5QI, 8AB, 8ANB, 8BAZ, 8BDO, 8BEF, 8BFX, 8BGN, 8BKE, 8BWA, 8CDN, 8CGN, 8CKM, 8CWR, 8DAK, 8DLO, 8FT, 8IFY, 8RT, 8STY, 8UE, 8YD, 8ZN, 9AEP, 9AJA, 9AOG, 9AON, 9APS, 9ARR, 9AXF, 9BD, 9BED, 9BIZ, 9BRL, 9BSG, 9BTJ, 9BDY, 9BZI, 9CFI, 9CR, 9DAR, 9DGQ, 9DKH, 9DSM, 9DWK, 9DXM, 9EI, 9EJ, 9KFN, 9NU, 9OX, 9SI, 9TRP, 9WC, 9ZAC.

5GP, Anniston, Ala.

Spark: 4FD, 4GN, 5MO, 5SM, 5TU, 5UD, (5VV), 5ZL, 8BDA, 8UC, 9ACB, 9AYY, 9DMJ, 9DZY, 9OX.

C.W.: 2FP, 3BLF, 3HL, 3TJ, 4AU, 4BQ, 4BY, 4EA, 4EB, 4EH, 4EN, 4FT, 4GH, 4JH, 4JK, 4KC, 4KF, 4LJ, 4LP, 4MW, 4NY, 4OD, 4ZF, 5AAM, 5ADE, 5AE, 5BA, 5BR, 5DI, 5DK, 5DO, 5DY, 5EK, 5EO, 5ES, 5FV, 5GH, 5HB, 5HL, 5HZ, 5IR, 5LA, 5NV, 5PX, 5QI, 5RJ, 5SZ, 5UN, 5XAD, 5XY, 5ZAP, 5ZAY, 5ZT, 6KA, 8AFD, 8AFY, 8ANB, 8AXB, 8BDO, 8BDU, 8BFM, 8BFX, 8BJA, 8BKE, 8BNU, 8BVR, 8BWA, 8CDZ, 8CGX, 8CJH, 8CKO, 8CNG, 8CNZ, 8DAK, 8FT, 8IF, 8KH, 8SB, 8SP, 8UC, 8UE, 8UK, 8VY, 8WR, 8XJ, 8ZAE, 8ZZ, 9AAP, 9ABV, 9AJH, 9AMI, 9AOG, 9AON, 9AOU, 9AOV, 9APH, 9APS, 9AQM, 9ARR, 9ARS, 9ASL, 9AWF, 9AWH, 9AXB, 9BCF, 9BDB, 9BEH, 9BGH, 9BHD, 9BHI, 9BRK, 9BRL, 9BSG, 9CFL, 9CIE, 9CJJ, 9CJT, 9CP, 9DEK, 9DGQ, 9DKY, 9DE, 9DBL, 9DSM, 9DTJ, 9DU, 9DUG, 9DWN, 9DXD, 9DXN,

9DYN, 9EI, 9EJ, 9IL, 9IO, 9JD, 9LK, 9LQ, 9LZ, 9NU, 9OX, 9PF, 9UU, 9WS, 9XAJ, 9XL.

5DI, 2209 Azle Ave., Ft. Worth, Texas

C.W.: 4AU, 4BQ, 4CF, 5AE, 5BN, 5BQ, 5DO, 5DY, 5EK, 5FV, (5HB), 5IR, 5JL, (5LA), 5NK, (5NS), 5NV, (5RB), (5RJ), 5UK, (5VA), (5ZA), 5AAW, 5ZAW, 7LU, 8BV, 8SB, 8SL, (8WR), 8ZQ, 9AMI, (9AMK), (9AOG), (9AON), 9APS, 9AVN, 9ZZ, 8AXT, 8BFX, (8BWA), (9DR), 9DO, (9NU), 9PW, 9XL, (9ZE), (9ABV), 9AIX, (9AMB), 9AMQ, (9AYS), 9BBD, 9BDB, (9BHD), (9BJB), (9BJU), (9BSG), (9BZI), 9BZW, 9CCJ, 9CCS, (9CJJ), 9CQX, 9DKY, (9DSM), (9DTJ), (9DTM), (9DUG), 9DXN, 9ZAC.

Spark: (5NS), (5OE), (5TU), (5ABY), 5AEJ.

5ES, Montgomery, Ala.

(3ALN), (3BZ), (3BLF), 4AF, 4BL, 4EB, (4KF), 4KC, 4KU, 4LP, 4MW, (5CZ), (5DO), (5LA), 5VN, (5XR), (5ACX), 8AB, (8FB), (8FT), (8KH), (8UE), (8ZN), (8ZO), (8ANB), 8BKE, 8BAF, (8CDZ), (8CJY), (8CKO), 9DW, 9AON, 9APS, (9AJH), 9API, (9DFB), 9DZY.

6ASN, Berkeley, Cal.

Spark: 6GR, 6FH, 6HC, 6KL, 6OD, 6OL, 6TG, 6CC, 6AAK, 6AHF, 6AHG, 6AHP, 6APY, 6AVR, 6BTB, 7BK, Can. 9BD.

C.W.: 6BF, 6EB, 6EN, 6FH, 6GR, 6KA, 6KU, 6NX, 6RD, 6ND, 6ZN, 6ABQ, 6AOV, 6BCJ, 6BEG, 6BES, 6BIR, 6BJX, 6BMD, 6BQY, 6BTB, 6BZY.

6BQC, Los Angeles, Cal.

C.W.: (6AK), (6BF), (6FH), (6GR), (6GX), (6GY), (6IK), (6KU), (6LO), 6NX, 6OH, (6RD), (6ZA), (6ZB), (6ZF), (6ZO), (6ZS), (6ZX), (6ZZ), 6AAT, (6ABQ), (6AGJ), (6AOK), (6AOZ), (6AQW), (6ARB), (6ASJ), (6AWT), 6BCJ, (6BHK), (6BJY), 6BQF, (6BQL), 6BUM, (7LU), (7MF), (7NA), (7OT), (7OZ), 7SC, (7AEA) QRA? (9AJA) QRA? (9AMB).

Spark: (6HC), 6GR, 6IC, 6TU, 6ZU, (6AAK), 6AKL, 6AMK, (6AUD), (6BJU).

Radio 6BSQ, Box 1296, Nogales, Ariz., Detector Only

Spark: 5EW, 5FO, 5GO, 5HK, 5HM, 5IF, 5IR, 5TM, 5IS, 5MJ, 5OF, 5QS, 5RA, 5SG, 5XA, 5XB, 5XF, 5XI, 5XJ, 5XD, 5XU, 5YM, 5YQ, 5ZA, 5ZAD, 5ZAE, 5ZAG, 5ZAK, 5ZJ, 5ZR, 6AAA, 6AH, 6AAH, 6AAK, 6ABM, 6ACK, 6ACY, 6AEC, 6AEH, 6AEZ, 6AHV, 6AIF, 6AKZ, 6AMN, 6AMT, 6APP, 6AQA, 6ATG, 6AUL, 6ATQ, 6BBH, 6BS, 6BY, 6FA, 6AJH, 6EB, 6EL, 6GJ, 6GI, 6GT, 6IV, 6KO, 6IS, 6LC, 6SJ, 6TG, 6TV, 6ZAL, 6ZAM, 6ZAR, 6ZB, 6ZE, 6ZR, 6ZU, 6ZZ, 7YA, 7ZM, 7ZO, 7ZT, 7ZV, 9APN, 9AQE, 9BBA, 9DSD, 9NR, 9YAE.

C.W.: 2NZ, 3FS, 4GL, 4BY, 4CB, 4XB, 4ZC, 5KP, 5CI, 5AA, 5EO, 5FV, 5IC, 5NK, 5PU, 5ZA, 5YL, 5XJ, 5ZAF, 5ZAK, 5ZAN, 5ZU, 6AAG, 6AAV, 6ALV, 6ASV, 6AUL, 6BLA, 6CU, 6EB, 6EN, 6LD, 6MT, 6XAQ, 6XAD, 6XV, 6XZ, 6ZB, 6ZF, 6ZZ, 6ZAF, 6AIF, 7LN, 8XV, 8BOD, 8BDU, 8AGZ, 9AMB, 9AAU, 9AQR, 9ARJ, 9AY, 9AIG, 9AYS, 9AWL, 9BBB, 9BIR, 9BJI, 9BOM, 9BOW, 9BSG, 9DCF, 9DTM, 9DZJ, 9FM, 9NX, 9PI, 9PS, 9WD, 9VE, 9WU, 9XAQ, 9XM, 9ZAK, 9ZE.

7ATH, Monroe, Wash.

Spark: 6ABX, 6AJR, 6ALA, 6ALU, 6AQA, 6ARK, 6ARS, 6ATU, 6CC, 6GF, 6RR, 6TU, 7AEA, 7BH, 7BK, 7CU, 7EY, 7FI, 7FQ, 7GE, 7GF, 7HD, 7HT, 7IC, 7IH, 7IW, 7IY, 7JD, 7JF, 7JW, 7KJ, 7KS, 7MF, 7MU, 7NR, 7NL, 7NN, 7NX, 7NZ, 7OJ, 7OH, 7OW, 7RC, 7SA, 7TJ, 7TO, 7TW, 7VE, 7VF, 7VZ, 7WG, 7WR, 7ZK, Canadian 9BD.

C.W.: 5LA, 6AAT, 6AIY, 6AK, 6ALU, 6AMZ, 6ARB, 6ARC, 6ASJ, 6AW, 6AWT, 6BCD, 6BCJ, 6BEG, 6BOE, 6BQC, 6BZG, 6CJ, 6EN, 6FH, 6FT, 6GR, 6KA, 6KU, 6LF, 6NX, 6PI, 6RD, 6RM, 6RR, 6TV, 6VM, 6XAD, 6XE, 6XZ, 6ZF, 6ZI, 6ZO, 6ZX, 7ACK, 7AEA, 7AFW, 7AGX, 7AW, 7BK, 7BQ, 7BS, 7DP, 7FL, 7HS, 7IY, 7LR, 7LU, 7MF, 7NA, 7NJ, 7NN, 7OT, 7OZ, 7QE, 7QW, 7RN, 7SC, 7SY, 7TN, 7YA, 7ZB, 7ZU, 9AJA, 9AYU, 9DTM, BT3, Canadians 4BV, 5CT.

75G, Aberdeen, Wash.

Spark: Can. 9EC, 5DO, 9BD, 6AAK, 6ABM, 6ABU, 6ABW, 6ABX, 6AEH, 6AIH, 6AJH, 6AJR, 6AKT, 6ALA, 6ALW, 6AMK, 6AMZ, 6ANG, 6AQU, 6AR, 6ARK, 6ARS, 6AS, 6ATV, 6AVB, 6AVM, 6AWH, 6BAX, 6BB, 6BIU, 6BNE, 6BNT, 6CC, 6FH, 6GF, 6GP, 6GR, 6GT, 6HC, 6HP, 6LE, 6IC, 6KM, 6OD, 6OL, 6TC, 6TU, 6VA, 6VX, 6ZU, 7ADL, 7AEA, 7AGI, 7BB, 7BG, 7BK, 7BZ, 7CH, 7CK, 7EY, 7FI, 7FP, 7GE, 7IN, 7IW, 7IV, 7JF, 7JW, 7KE, 7KS, 7MU, 7MY, 7MZ, 7OF, 7OH, 7OT, 7OW, 7PQ, 7TJ, 7TO, 7TW, 7VE, 7VF, 7WG, 7ZK, 7ZP, 7ZS.

C.W.: 1ACG, 1ANE, 1ANQ, 1XM, 2AFP, 2ARP, 2AWF, 2BEE, 2BJO, 2BML, 2CBG, 2FP, 2KL, 2NZ, 3AW, 3AIP, 3ANJ, 3APD, 3AQR, 3BZF, 3BNU, 3BVC, 3BZ, 3CB, 3CBM, 3IW, 3KO, 3LP, 3LW, 3TJ, 3VW, 4BJ, 4BQ, 4BX, 4EA, 4EH, 4ZF, 5EK, 5QI, 5AG, 5AM, 5ACF, 5ACH, 5ADT, 5AFD, 5AFY, 5AIM, 5AIO, 5AMD, 5ANB, 5APB, 5APG, 5APT, 5AQO, 5ASV, 5ASZ, 5ATI, 5ATU, 5AUW, 5AXN, 5BAS, 5BDB, 5BDO, 5BDU, 5BDY, 5BFM, 5BSS, 5BKE, 5BKI, 5BPL, 5BQN, 5BRM, 5BWA, 5CAG, 5CAY, 5CAZ, 5CBU, 5CCX, 5CFX, 5CFN, 5CJH, 5CKM, 5CKO, 5CKX, 5CMI, 5CVJ, 5CKM, 5DAK, 5FT, 5JD, 5LQ, 5OW, 5UC, 5UE, 5UK, 5UZ, 5WI, 5XJ, 5ZAE, 5ZAG, 5ZO, 5ZY, 5ZZ, 5AAP, 5AIE, 5AIU, 5AJH, 5AJP, 5AMI, 5AON, 5APS, 5AUA, 5BGH, 5BN, 5BSG, 5BWS, 5CBA, 5CCS, 5CENV, 5DFF, 5DJB, 5DKH, 5DSM, 5DTR, 5DTJ, 5DXN, 5EJ, 5GL, 5LZ, 5UC, 5UU, 5WR, 5YQ.

88EP, Defiance, Ohio

Spark: 2AWF, 2FP, 2OM, 3ACY, 3BVC, 3FP, 4BI, 4GN, 5ZL, 5AGP, 5AFK, 5AIT, 5AIZ, 5AVX, 5AWM, 5AXN, 5AYO, 5BDA, 5BTJ, 5AUX, 5AWM, 5AXN, 5AYC, 5BDA, 5BTJ, 5CTI, 5EA, 5EW, 5KG, 5KY, 5OL, 5RQ, 5STK, 5UC, 5VH, 5VS, 5WU, 5WZ, 5ZO, 5ZY, 5AAW, 5AFA, 5AIP, 5AMQ, 5AMT, 5APW, 5ARR, 5AZA, 5AZF, 5BMN, 5CP, 5DJB, 5DMJ, 5DSM, 5DTN, 5DXT, 5DZY, Can. 3GN, 3CX, 3BP.

C.W.: 1CGJ, 1LANE, 1ANQ, 1XM, 2AFP, 2ARP, 2AWF, 2BEE, 2BJO, 2BML, 2CBG, 2FP, 2KL, 2NZ, 3AW, 3AIP, 3ANJ, 3APD, 3AQR, 3BZF, 3BNU, 3BVC, 3BZ, 3CB, 3CBM, 3IW, 3KO, 3LP, 3LW, 3TJ, 3VW, 4BJ, 4BQ, 4BX, 4EA, 4EH, 4ZF, 5EK, 5QI, 5AG, 5AM, 5ACF, 5ACH, 5ADT, 5AFD, 5AFY, 5AIM, 5AIO, 5AMD, 5ANB, 5APB, 5APG, 5APT, 5AQO, 5ASV, 5ASZ, 5ATI, 5ATU, 5AUW, 5AXN, 5BAS, 5BDB, 5BDO, 5BDU, 5BDY, 5BFM, 5BSS, 5BKE, 5BKI, 5BPL, 5BQN, 5BRM, 5BWA, 5CAG, 5CAY, 5CAZ, 5CBU, 5CCX, 5CFX, 5CFN, 5CJH, 5CKM, 5CKO, 5CKX, 5CMI, 5CVJ, 5CKM, 5DAK, 5FT, 5JD, 5LQ, 5OW, 5UC, 5UE, 5UK, 5UZ, 5WI, 5XJ, 5ZAE, 5ZAG, 5ZO, 5ZY, 5ZZ, 5AAP, 5AIE, 5AIU, 5AJH, 5AJP, 5AMI, 5AON, 5APS, 5AUA, 5BGH, 5BN, 5BSG, 5BWS, 5CBA, 5CCS, 5CENV, 5DFF, 5DJB, 5DKH, 5DSM, 5DTR, 5DTJ, 5DXN, 5EJ, 5GL, 5LZ, 5UC, 5UU, 5WR, 5YQ.

88CN, Cambridge, O. (1 Tube)

C.W.: 1ACS, 1AJU, 1ANQ, 1AUN, 1AUZ, 1BHQ, 1CBK, 1CHJ, 1CPN, 1CQU, 1FB, 1ND, 2AMF, 2ARV, 2AUZ, 2AUH, 2AWF, 2AYZ, 2BES, 2BJO, 2BJY, 2BNZ, 2BQZ, 2BQU, 2BRB, 2CBG, 2CGI, 2EH, 2KL, 2MM, 2TN, 2TP, 3AEV, 3ALN, 3ANO, 3AQA, 3AQR, 3ATU, 3AWH, 3BIJ, 3BLF, 3BLT, 3BNU, 3BZ, 3CA, 3CBM, 3CC, 3CI, 3IU, 3LJ, 3LR, 3MK, 3OD, 3GS, 3SM, 3TJ, 3VW, 3VZ, 3XW, 3YQ, 3ZAF, 3ZW, 4BX, 4DS, 4EB, 4EN, 4FT, 4GH, 4K, 4NT, 5AAM, 5EK, 5QI, 5UK, 5ACF, 5ACH, 5AER, 5AES, 5AFD, 5AFT, 5AFY, 5AIO, 5AKP, 5AMD, 5AMH, 5AMM, 5AMQ, 5ANX, 5ANJ, 5ATU, 5AU, 5AXN, 5BDB, 5BEF, 5BF, 5BFM, 5BFX, 5BIQ, 5BJV, 5BNU, 5BQC, 5BOZ, 5BQF, 5BRM, 5BUZ, 5BUX, 5CAY, 5CBC, 5CDZ, 5CFF, 5CGN, 5CIY, 5CJH, 5CKO, 5CMI, 5CMM, 5CPT, 5CYE, 5EH, 5FT, 5LT, 5NB, 5ON, 5PD, 5PH, 5PT, 5SB, 5SL, 5TC, 5UE, 5UK, 5VE, 5VQ, 5ZAE, 5ZAG, 5ZG, 5ZZ, 5AAP, 5AJH, 5AKD, 5AON, 5ARF, 5ARZ, 5AU, 5BJV, 5BLC, 5BLD, 5BSG, 5BTT, 5BZI, 5CJA, 5DEK, 5DFF, 5DIB, 5DRR, 5DTJ, 5DXN, 5HU, 5II, Canadian 9AL.

Spark: 2ARD, 2OM, 3ALU, 3AVO, 3BDA, 3BMR, 3BOC, 3CBC, 3CJZ, 3EW, 3RQ, 3XJ, 3ZO, 3ZY, 3AZA.

8CZN, Cleveland, Ohio (Reinartz and 1 Tube)

Spark: 2FP, 2OM, 3HJ, 4FD, 4HS, 9CF, 9KI, 9OX, 9UH, 9ZN, 9AMK, 9AZA, 9BMN, 9DMJ, 9DTN, 9DWM, 9DXT, 9DZY.

C.W.: 1ES, 1GV, 1HK, 1ON, 1QN, 1SC, 1UH, 1XM, C.W. & I.C.W., 1XP, 1XX, 1ACS, 1ACU, 1AGH, 1AGI, 1AIQ, 1AJU, 1AMI, 1ANQ, 1AU, 1AUZ, 1AWB, 1AZW, 1BDV, 1BKQ, 1BNT, 1BQI, 1BQK, 1BQT, 1CHJ, 1CMK, 1CNE, 1CPN, 1CPO,

1CQU, 1CZA, 2BG, 2EH, 2FP, 2GK, 2IG, 2KL, 2KY, 2TS, 2UD, 2AWF, 2BDG, 2BIR, 2BML, 2BMR, 2BNC, 2BQH, 2BQU, 2BRB, 2BRC, 2BUM, 2BYU, 2CBG, 2CFI, 2CGJ, 2CKN, 2CPD, 3BZ, 3CA, 3FS, 3HL, 3LP, 3MK, 3TJ, 2TN, 3ZO, 3ZW, 3AAY, 3ALN, 3ANJ, 3AQF, 3AQR, 3AUU, 3AWH, 3BAC, 3BHC, 3BIJ, 3BIT, 3BJY, 3BLF, 3BNU, 3BQU, 3BRA, 3BVL, 3BWQ, 4AU, 4BQ, 4BX, 4BZ, 4DC, 4DS, 4EA, 4EB, 4EH, 4EK, 4GH, 4GX, 4ID, 4JK, 4KC, 4KF, 4LP, 4MW, 4NT, 4OD, 4QT, 4ZT, 5DA, 5DG, 5DI, 5DO, 5HB, 5JL, 5NV, 5QI, 5AAM, 5ADE, 5ALD, 5CP, 5DR, 5EI, 5FK, 5GR, 5II, 5LQ, 5LZ, 5NU, 5PF, 5RK, 5UH, 5WC, 5Dhte, 9WU, 9ABV, 9AAP, 9AAT, 9AJH, 9ALB, 9AMI, 9AOU, 9APW, 9ARM, 9ARK, 9ARR, 9AWF, 9AXF, 9AYA, 9AYS, 9BDB, 9BED, 9BEH, 9BES, 9BFG, 9BHI, 9BLC, 9BRL, 9BSG, 9BYA, 9BZI, 9CAS, 9CCS, 9CGD, 9CKT, 9CJA, 9CJJ, 9CNV, 9CYT, 9DBV, 9DCR, 9DEK, 9DFB, 9DGG, 9DKM, 9DKS, 9DKY, 9DTJ, 9DTN, 9DIM, 9DQU, 9DUG, 9DVA, 9DVR, 9DVW, 9DWK, 9DXN, 9DYT, 9DZW, 9YAJ.

8ASL, Fredonia, N. Y.

Spark: 1ADC, 1KV, 2AAF, 2AHU, 2AJE, 2ARB, 2BSC, 2DN, 2FP, 2OM, 2NF, 2RM, 3AJD, 3AWF, 3AC, 3BVC, 3FP, 3HJ, 3RW, 4FB, 4AEO, 4AHS, 4AIB, 4AII, 4AIZ, 4AJT, 4APB, 4AUX, 4AXQ, 4AYM, 4BDA, 4BGT, 4BLF, 4BQA, 4BQC, 4BRL, 4BXC, 4BYF, 4CBC, 4CEB, 4CMY, 4CP, 4CSD, 4CUG, 4EO, 4EW, 4FE, 4KG, 4NZ, 4OI, 4RQ, 4STC, 4TT, 4UC, 4VH, 4VQ, 4WO, 4ZD, 4ZO, 4AFK, 4AIB, 4ARR, 4CP, 4DEN, 4DWM, 4DZY, 4JX, 4LF, 4MC, 4ZN, Can. 3BA.

C.W.: 1ACS, 1AGH, 1AGI, 1AIQ, 1AJU, 1ANQ, 1AR, 1AWB, 1AZD, 1AZM, 1BES, 1BKQ, 1BQK, 1CCX, 1CCZ, 1CFI, 1CHJ, 1CK, 1CL, 1CLW, 1CNE, 1FB, 1HK, 1II, 1PY, 1QN, 1QV, 2AFP, 2ANJ, 2AUZ, 2AWF, 2BG, 2BJO, 2BML, 2BNZ, 2BQD, 2BQU, 2BUM, 2CBG, 2CBG, 2CDS, 2CGI, 2FP, 2GK, 2HW, 2KL, 2NZ, 2TS, 2UD, 2AFB, 2AJD, 2ANJ, 2AQR, 2AXY, 2BIJ, 2BIT, 2BLF, 2BNU, 2BVC, 2BVL, 2BX, 2CBM, 3CC, 3IW, 3OK, 3OT, 3QV, 3SM, 3TJ, 3TN, 3VW, 3WF, 4BQ, 4BX, 4DC, 4EA, 4EB, 4EK, 4LJ, 4LP, 4NV, 4ACF, 4ADM, 4AFD, 4AFL, 4AGE, 4AIO, 4ALT, 4AM, 4AMM, 4ANB, 4ANO, 4ANZ, 4APT, 4APW, 4AQA, 4AQO, 4ARD, 4ASZ, 4ATU, 4AWN, 4AWY, 4AWZ, 4AYB, 4BDB, 4BDM, 4BDU, 4BFM, 4BJS, 4BJV, 4BKH, 4BNU, 4BRC, 4BRQ, 4BRT, 4BWA, 4BWB, 4BXH, 4BZF, 4CAZ, 4CBJ, 4CCX, 4CDZ, 4CEF, 4CGN, 4CID, 4CJH, 4CKM, 4CKO, 4COI, 4CTN, 4CUU, 4CUV, 4CYT, 4GH, 4HJ, 4KG, 4ONE, 4KH, 4LT, 4NB, 4ND, 4OW, 4QJ, 4SB, 4SP, 4UB, 4UC, 4UE, 4UK, 4WA, 4XE, 4ZAE, 4ZAN, 4ZZ, 4ZZ, 4AAP, 4AON, 4AJH, 4BDB, 4BSG, 4BYA, 4BZI, 4DEK, 4DFB, 4DTJ, 4EI, 4UH, Can. 3JI, 3KP, 3SP, 3XX, 3AL.

8AUU, Canton, Ohio

Spark: 1ALY, 1AKG, 1AZK, 1NF, 2AJE, 2FP, 2GP, 2OM, 2RM, 3ACY, 3BNU, 3GU, 3HJ, 4FD, 5BI, 6IO, 6PY, 8AEG, 8AIV, 8APM, 8ANW, 8ASL, 8AIB, 8AQO, 8AZF, 8AXT, 8AUX, 8AXN, 8AX, 8BDZ, 8BAY, 8BAZ, 8BNH, 8BNO, 8BNU, 8BDA, 8BRL, 8BQF, 8CLO, 8CDV, 8CPZ, 8CCT, 8CSD, 8EA, 8EB, 8EK, 8EO, 8EW, 8JP, 8JX, 8OI, 8RK, 8SE, 8TC, 8TT, 8UC, 8UD, 8OE, 8XE, 8ZO, 8ZY, 9AIW, 9AIR, 9AMK, 9AIX, 9AAR, 9APH, 9AJA, 9AAW, 9ACB, 9AZA, 9BXC, 9BZX, 9BCT, 9CFF, 9CCJ, 9CP, 9DXT, 9DEN, 9DDZ, 9DTN, 9DZY, 9JB, 9JX, 9LF, 9LQ, 9OX, 9QC, 9UH, 9WA, 9WD, 9ZN.

C.W.: 1AYZ, 1AZW, 1AMK, 1ACS, 1AGI, 1AMQ, 1ACH, 1AKA, 1AWB, 1AWW, 1BWY, 1BND, 1BKP, 1BKQ, 1BGF, 1BXQ, 1BWZ, 1CQM, 1CJN, 1CMK, 1CQU, 1CAZ, 1CGO, 1CIK, 1CM, 1FB, 1GV, 1HW, 1PQ, 1PR, 1VQ, 1XM, 1XP, 1XZ, 1ZX, 2AWF, 2AFB, 2AAW, 2AMH, 2AFP, 2AUZ, 2AFD, 2AUZ, 2AWF, 2BNZ, 2BQH, 2BEH, 2BBX, 2BRC, 2BMQ, 2BFX, 2BQU, 2BOB, 2BVC, 2BDU, 2BDF, 2BVI, 2BVH, 2BQ, 2CDG, 2CBW, 2CBG, 2CDN, 2FA, 2GK, 2HW, 2KL, 2MK, 2NZ, 2OT, 2RU, 2VA, 2VW, 2ZO, 3AVY, 3ATJ, 3ANJ, 3ALN, 3ADY, 3ADN, 3BZV, 3BHM, 3BRW, 3BIJ, 3BLF, 3BDF, 3BNO, 3BJY, 3BNU, 3BGT, 3BZF, 3BVL, 3BY, 3BZ, 3CBM, 3CC, 3CS, 3HJ, 3IL, 3IW, 3JK, 3LP, 3LR, 3MK, 3OD, 3OW, 3PB, 3TJ, 3VW, 3WF, 3XW (fone), 3ZO, 4AW, 4BQ, 4BX, 4BY,

(Concluded on page 76)

Power Factor Applied to Radio Condensers

By Paul G. Watson, 3BV

MANY amateurs have constructed condensers very carefully, only to find that on completion they did not have the capacity that was desired. This is particularly true of transmitting condensers for spark sets. It is with these partial failures in mind that this article is written, and since many of these troubles center around the "power factor" of the condenser, it has been taken up from that viewpoint. The points where the losses occur will be brought out, and the reasons why the actual capacity and the effective capacity are sometimes different.

The "power factor" is the center of this set of calculations, and for the benefit of those who are not familiar with this expression, a brief explanation follows. Power factor is the cosine of the phase angle, of an alternating current. The phase angle is the angle falling between voltage amplitude and current amplitude in the same alternation. The sine curve which is commonly used to represent alternating current variation is the voltage curve, the current curve being of slightly different form, and say lagging behind the voltage rise and fall. This lag is expressed in terms of the angle falling between these two curves, the cosine functions being the power factor. Power factor in A.C. circuits is expressed in terms of the power as follows:

$$\text{Power Factor} = \frac{\text{Watts}}{\text{Volts} \times \text{Amps.}}$$

The watts are the actual power consumed, while the denominator is the product of volts and amperes in the same circuit. The factor will vary greatly in this case depending on the nature of the load.

Power losses in radio condensers can come from a great number of sources, but generally these losses can be classed under some of the cases taken up here. Losses may be due to dielectric imperfection, plate resistance, lead resistance, brush discharge, and by dielectric absorption.

The first case to be considered will be the loss due to ordinary conduction, or otherwise dielectric imperfection, and known as leakage. This loss in most cases is negligible at high frequencies, but at low frequencies it adds materially to the phase difference. The effect on the circuit is that of placing a resistance in parallel with the capacity. The effect is shown in Fig. 1 by vectors and a diagram. The current divides between the two branches. I_r , the current through the resistance, is in phase with the applied E (effective electro-

motive force) and the current through the condenser, I_c , leads E by 90° . The resulting I (current) leads the E by an angle which is less than 90° by the phase difference ψ . In Fig. 1 it can be seen that

$$\tan \psi = \frac{1}{R\omega C}$$

where R =insulation resistance

$$\omega = 2\pi f$$

C =capacity in microfarads

f =frequency.

The extent of this effect at low frequency is best shown by assuming a condenser having a capacity of .01 mfd., an insulation resistance of 10 megohms, and a frequency of 60 cycles. In this case

$$\text{Power Factor} = \frac{1}{(10)^6 \cdot 377 (10)^{-4}} = .027$$

From this it can be seen that 2.7% of the current flows by conduction rather than electrical displacement. At frequencies higher, say 10,000 cycles, this loss would

SHUNT RESISTANCE

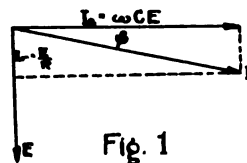
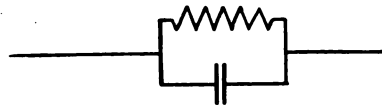


Fig. 1

drop to .00016 or .016%, which is negligible. For this reason, in radio work, unless the dielectric is extremely poor, this loss can be neglected.

The next case to be considered is the case of resistance in series with the capacity. This resistance can come from poor contacts, lead wire resistance, resistance of the plates themselves, or by poor connections to the plates. This resistance effects the circuit quite differently from the previous case where the resistance was in parallel.

In Fig. 2 is an elementary diagram and a vector diagram of the effect of this action. The E_r across the resistance is in phase with the current I while E_c lags 90° behind I . The power factor taken from Fig. 2 is as follows:

Power Factor = $r\omega C$.

r = resistance in ohms.

If $r = 1$ ohm, $C = .01$ mfd., the power factor at 60 cycles is $3.8(10)^{-4}$ which is negligible. If however the frequency is raised to 1,000,000, corresponding to a 300 meter wave length, the power factor of this condenser becomes .063 or a loss of 6.3% energy at the resistance. This is a very large loss and would upset calculations if not considered.

In the foregoing example r was assumed to be 1 ohm. It is sometimes more than this in some condensers, especially the ordinary paper kind, but in most others a high series resistance indicates a defect.

As the frequency increases, "skin effect" causes a slight increase in resistance. On this account, the power factor increases in proportion to a power of the frequency which is slightly greater than one.

The dielectric absorption loss manifests itself in the following manner. When a current is fed into the condenser, the instantaneous charge is followed by a small and decreasing flow of current. This current is the current which, for clearness' sake, we will assume is actually absorbed in the dielectric. In the discharge cycle the reverse to the charging takes place, i.e., the initial discharge is followed by a small current flow, which is gradually decreasing in value. This phenomenon is known as "electrical viscosity." The energy which causes the small current to flow is loss, and manifests itself in the form of heat in the condenser. Absorption is expressed in the terms of resistance, the most convenient being to assume the absorption as a series resistance, and is known as the "equivalent resistance" of the condenser. Such a condenser is calculated according to the data in Fig. 2 with the power factor equal to $r\omega C$. This resistance is constant at a given frequency, but varies with the frequency. The exact laws governing this variation have not been determined, but for approximate calculations the power factor can be assumed to be constant, r varying inversely with f or in direct proportion to wave length. This fact is taken from $r\omega C$ being constant in value. Most condensers in radio circuits have a constant power factor over the radio frequency range.

A condenser operated in air under a high tension ionizes the air near the edges of its plates, for example a Leyden jar. At extreme voltages this ionization takes the form of a blue discharge, most noticeable at the corners or on a projecting point. The power factor in circuits of this nature is influenced by this discharge which is quite large in comparison to absorption and resistance losses. In his research work Dr. Austin found the power factor of a Leyden jar to be constant up to 10,000 volts, from 10,000 to 22,000 volts the increase was about as the square of E and above

this figure, it was at a still higher ratio, increasing to the fourth power of E . With the exceptions of the Leyden jar and the compressed air condenser, the power factor is not a voltage function. Where solid dielectric is used, power factor depends largely on absorption and resistance. If the power factor increases with frequency, it is a sure sign of series resistance. At frequencies of 250,000 to 300,000 the effect of series resistance is often present due to the use of tin foil for plates.

A few formulas for condenser calculations follow. A careful study of some of

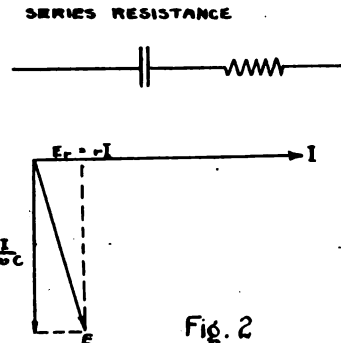


Fig. 2

these may show the direct cause of failure of the transmitting condenser to function properly.

Power input in a condenser—

$$P = .5 \times 10^{-4} NCE^2$$

P = Power in watts

C = Capacity in Mfd.

N = Number of charges per second

E = Volts (maximum)

This formula can be expressed in other forms: $P = 10^{-4} f CE^2$, where f = cycles per second; $P = 10^{-4} NCE^2$, where E = effective voltage of the A.C. circuit; or $P = 2 \times 10^{-4} f CE^2$.

Total power loss in a condenser is expressed in the following formula:

$$P = \omega CE^2 \sin \psi$$

where P = Power loss in watts.

The effective resistance of a condenser is expressed as follows:

$$r = \psi \times \frac{.001}{C} \times \frac{\lambda}{1000} \times .154$$

r in ohms

C = micromicrofarads

λ = in meters

While some of the preceding formulas may seem complicated to the casual observer, it will be found that simple substitution of numerical values for letters and performance of the indicated mathematical operation is about all that is needed in most cases.

Application of some or all of these formulae to condensers, especially those of

higher power, will result in the improvement of conditions, particularly if trouble has previously been experienced.

As previously mentioned series resistance is common, from long leads to the condenser, poor or dirty contacts, and the use of tin foil, where long plates are used. Parallel resistance comes from poor oil in the condenser, the presence of dirt in the oil, defective dielectric sheets, dust on the connections, and likewise moisture.

The writer has visited many amateur stations, in almost all sections of the country, and has noticed that the defects mentioned here existed in many of them.

CALLS HEARD

(Concluded from page 75)

4AU, 4BQ, 4BX, 4BZ, 4CR, 4DS, 4EA, 4EB, 4EX, 4FW, 4GH, 4GX, 4HW, 4KF, 4LP, 4MW, 4NT, 4NV, 4OAM, 4DI, 4DO, 4FV, 4HL, 4IR, 4JL, 4LA, 4LJ, 4NV, 4QI, 4TV, 4UN, 4VA, 4VI, 4AB, 4ABA, 4ABR, 4ACF, 4ACH, 4AFD, 4AFT, 4AFY, 4AHL, 4AIG, 4AIM, 4AIO, 4AKH, 4ALB, 4ALT, 4AMD, 4AMK, 4AMM, 4AMQ, 4ANB, 4ANX, 4APT, 4AQF, 4AQO, 4ARB, 4ARD, 4ASM, 4ASV, 4ASZ, 4ATR, 4ATU, 4AUA, 4AVD, 4AWM, 4AWT, 4AWZ, 4AXE, 4AXM, 4AXN, 4AYN, 4BAH, 4BAQ, 4BAX, 4BCF, 4BCJ, 4BDB, 4BDD, 4BDO, 4BDU, 4BDY, 4BEF, 4BEH, 4BFM, 4BFX, 4BGG, 4BHE, 4BJR, 4BJS, 4BJV, 4KE, 4KEM, 4KEN, 4BKS, 4BKU, 4BNJ, 4BNQ, 4BNU, 4BNW, 4BO, 4BOX, 4BFA, 4BPI, 4BQF, 4BQY, 4BRC, 4BEF, 4BRM, 4BRN, 4BRQ, 4BRT, 4BRW, 4BSF, 4BSJ, 4BTU, 4BUM, 4BVR, 4BYT, 4BWA, 4BWB, 4BXA, 4CAB, 4CAG, 4CAT, 4CAZ, 4CBJ, 4CBX, 4CCX, 4CDZ, 4CEI, 4CF, 4CFB, 4CGM, 4CGN, 4CGX, 4CL, 4CID, 4CIZ, 4CJH, 4CKM, 4CKO, 4CNW, 4COI, 4COON, 4CPD, 4CPO, 4CPX, 4CTL, 4CTW, 4CUR, 4CYV, 4DA, 4DAK, 4DCF, 4DM, 4DQF, 4DWE, 4DZW, 4FT, 4HJ, 4HM, 4IB, 4IE, 4KG, 4KH, 4LT, 4MB, 4NB, 4NV, 4WR, 4OW, 4PD, 4QB, 4RT, 4SB, 4SE, 4SL, 4SP, 4UC, 4UE, 4UK, 4UZ, 4VE, 4VQ, 4VY, 4XE, 4YM, 4ZA, 4ZAE, 4ZAG, 4ZN, 4ZQ, 4ZR, 4ZK, 4ZZ, 4ABV, 4ABY, 4AHS, 4AIX, 4AJH, 4AJP, 4AKB, 4AKD, 4ALG, 4AMI, 4AMU, 4ANF, 4ANW, 4AON, 4AOU, 4AFS, 4APW, 4AQM, 4AQJ, 4ARK, 4ARZ, 4ASN, 4ATC, 4AUA, 4AUS, 4AUU, 4AWF, 4AWH, 4AWW, 4AXF, 4AXE, 4AXU, 4AYS, 4BAA, 4BAC, 4BAD, 4BAF, 4BAS, 4BCF, 4BCG, 4BDA, 4BDB, 4BDC, 4BHG, 4BGW, 4BHD, 4BIZ, 4BJR, 4BKO, 4BLC, 4BLG, 4BQW, 4BSD, 4BSG, 4BSM, 4BWA, 4BWR, 4BYA, 4BYZ, 4BZL, 4CBA, 4CBB, 4CCS, 4CCV, 4CUJ, 4CFI, 4CGK, 4CJA, 4CJH, 4CJJ, 4CKM, 4CMV, 4CF, 4CFJ, 4CPY, 4CQM, 4CR, 4CX, 4DBL, 4BDV, 4DCG, 4DCR, 4DEK, 4DFB, 4DKY, 4DGE, 4DIM, 4DJM, 4DJQ, 4DKE, 4DKY, 4DME, 4DNT, 4DQE, 4DQU, 4DR, 4DSG, 4DSM, 4DTJ, 4DUD, 4DUG, 4DVV.

9DR 1830 Stevens, Minneapolis, Minn.

2FP, 4BV, 4KF, 4MW, 4AA, 4AAR, (4DI), 4DO, 4DIH, 4EK, 4HB, 4MV, 4QI, 4RJ, 4UK, 4ZA, 4ZAW, 4ZAY, (4EA), 4LU, (4AB), 4AQ, 4EH, 4FT, 4IE, 4MQ, 4UC, 4UE, 4VE, 4VY, (4WR), 4ZO, 4ZZ, 4ADN, 4AFY, 4AIZ, 4APT, 4APW, (4ASV), 4ASY, 4ATU, 4BDO, (4BEF), 4BFT, 4BGO, (4BOX), 4BPL, 4BRQ, (4BRT), 4BVT, 4BWA, 4BXH, 4CGN, 4CJH, 4DAK, 4ZWN, (4FK), (4HG), (4JA), (4NU), (4NX), (4OX), (4XL), (4XT), (4ZC), (4ZN), (4AAP), (4ABD), (4AIX), (4AMB), (4AMI), (4AON), (4APS), (4ATU), (4BAF), (4BCF), (4BGH), (4BKJ), (4BQW), (4BMN), (4BSG), (4BTT), (4CCS), (4CFI), (4DBL), (4DFB), (4DKY), (4DPV), (4DPV), (4DML), (4DYZ), (4YAZ), (4YAK), (4ZAC), Can. 3KO.

9DEK, No. Judson, Ind.

C.W.: 1ADL, 1ANQ, 1AZW, 1BGF, 1BKQ, 1HX, 2AFP, 2AWF, 2BML, 2BNZ, 2CGU, 2FP, 2OM, 2NZ, 2VA, (4AAY), 4AEV, 4ALN, 4AQR, 4BIJ, 4BIT.

3BLF, 3BZ, 3CC, 3FS, (3QJ), 3ZO, 4BQ, 4BY, 4GH, 4GL, 4JH, 4KC, 4LP, 4MW, 4DA, 4EK, 4FV, 4HW, 4LJ, 4TC, 4ACF, (4AFD), 4AIO, 4AMD, (4ANB), (4APT), (4ASV), 4ATU, 4AXB, (4BCY), (4BDU), 4BEF, (4BEX), (4BFX), (4BGO), 4BIL, 4BKE, (4BOX), (4BRM), (4BVR), (4BWA), (4CAK), 4CAZ, (4CGX), 4CKO, (4CVY), (4CXW), (4AM), 4HJ, (4NB), (4SB), 4SP, (4ZZ), (4AAP), (4AFN), (4AIX), (4AIV), (4AJH), (4ARE), (4ARR), (4ASN), (4AYA), (4BDB), (4BED), (4BLC), (4BTA), (4BZI), (4CAH), (4CGK), (4CJA), (4DBL), (4DDY), (4DGE), (4DNJ), (4DRR), (4FO), (4IO), (4II), (4PA), (4UC), 4UU, (4OX), (4YAJ).

Spark: 2FP, 2OM, 4UU, 4AIB, 4AIZ, (4AAW), (4AMK), (4AOY), (4AXY), (4AYY), (4BDP), (4BMN), (4OX), Fone (4DTJ), QRA PSE.

9ZN's "FJ" at 5723 Winthrop Ave., Chicago.

(Loop & 3 Audio)

Spark: 2FP, 2OM, 4HJ, 4ZL, 4BO, 4EA, 4EB, 4FT, 4KJ, 4TT, 4UC, 4ZO, 4AIZ, 4BBU, 4BDA, 4CYU, 4FK, 4LF, 4FU, 4NQ, 4OF, 4PD, 4UH, 4VL, 4YB, 4AZA, 4BDS, 4BMN, 4DJN, 4DMJ, 4DZI, 4DZY.

C.W.: 1FB, 1AJP, 1AWD, 1AZW, 1BDI, 1BKQ, 1CKW, 2FP, 2AWF, 2BRB, 2CHG, 2CKL, 3CA, 3FS, 3LP, 3ZO, 3ZW, 3AYW, 3BIT, 3BLF, 3BNU, 4AF, 4BX, 4EX, 4JK, 4KF, 4LP, 4MW, 4ZF, 4EK, 4ES, 4DI, 4DO, 4JL, 4LJ, 4QL, 4UK, 4KA, 4AWT, 4LU, 4ZU, 4AN, 4AM, 4SCF, 4ST, 4HH, 4HJ, 4KG, 4PD, 4SB, 4UK, 4WA, 4XE, 4XJ, 4ZO, 4ZQ, 4ZZ, 4AFD, 4ADW, 4AWM, 4AQO, 4AWB, 4ASZ, 4AWT, 4APW, 4ARD, 4AOB, 4ANB, 4APF, 4APT, 4AMQ, 4ACF, 4ATU, 4BFM, 4BWA, 4BRW, 4BRT, 4BXH, 4BJS, 4BEF, 4BSS, 4BEX, 4BFX, 4BXA, 4BRM, 4BRC, 4BKE, 4BOX, 4BRQ, 4BYE, 4BYR, 4BNU, 4BXH, 4CAX, 4CUU, 4CKO, 4CAK, 4CGN, 4CJH, 4CBX, 4DR, 4FK, 4II, 4IO, 4JA, 4LQ, 4UH, 4AMI, 4AAP, 4ABV, 4AJP, 4AOG, 4AYS, 4AIU, 4AQM, 4ARZ, 4AOU, 4ARR, 4ARE, 4BSG, 4BGH, 4BLC, 4BZI, 4BED, 4BJV, 4BGW, 4BSZ, 4BTT, 4BEH, 4CJJ, 4CCV, 4CJA, 4DQE, 4DFB, 4DBL, 4DUG, 4DTJ, 4DEK, 4DPL, 4DZQ, 4DGE. Canadian C. W.: 3JI, 3KO, 4BV.



Radio Communications by the Amateurs

The Publishers of QST assume no responsibility
for statements made herein by correspondents.



Long-Wave Reception

Brooke, Va.

Editor, QST—

Kindly allow me to make the following reply to "A Novice" concerning his letter on page 54, September QST.

Taking each question in turn as presented in this letter I will state that, first of all, distance does not in any way depend upon the number of amplifiers used and a single tube will give just as great a distance as detector and any number of stages of audio amplification, as the signals cannot be amplified until they have been rectified by the detector tube and thereby made audible.

As to the coils "sweating." Very few *real amateurs* ever find any factory-made instruments ideal for their purpose and almost without exception some changes for the better have to be made to suit each individual requirement before best results are possible. The regular fibre bands of the honeycomb coils were replaced by specially treated "bakelite" bands to good advantage by the writer.

As I have always pointed out there is nothing "novel" about the hook-ups I have published in QST and I do not recommend "novel" hook-ups. However unless a set is properly constructed as to capacity and inductance effect and so arranged that leads are of a minimum length, a great variation in condenser readings for the same wave length will surely result and it should be the object of all builders to construct their sets in such a way that the condenser reading with any given coil for any given station will be as *high* as possible. This indicates that stray capacity and leads have been reduced to a minimum. If said set is so constructed there will be absolutely no variation in the size of coils required for any certain wave the year around and the condenser reading for that wave will remain the same. Knowing the habits of amateurs in planning sets more for looks than for actual operating results, necessitating different values of coils and condenser capacities, my readings previously given have always been a compromise between a poorly arranged set and one correctly arranged and from all accounts the compromise given by me tallies with the average amateur's figures. As a matter of fact regarding the size of coil for NAA or other stations op-

erating near his wave, HC or DL-750 coil is the proper secondary coil to use for maximum signal strength on a correctly designed set the year around. The coils are standard all right and the trouble is not with the coils but with the sets they are used on. Out of a great number of coils I have personally tested none of them vary to any extent that could account for the differences noted by "A Novice." One exception has been noticed and this was with a HC-1500 coil. This coil was stamped L-1500 but the coil was exactly L-1250 in value; therefore the discrepancy was evidently in labeling instead of winding.

Regarding reception. In the first place I have never recommended .001 mfd. condenser for the primary circuit. The value of coils in inductance makes it practically a necessity to use condensers of larger values on long wave work, and the larger the aerial the larger the condenser should be. This accounts in part for the lack of "pep" shown when primary is tuned.

However, this does not account for the big trouble these days. When my first article on H.C. coils was written we had NSS operating on 16,900 meters, MUU on 14,000 meters, WII, then an "N" station, on 13,600, POZ on 12,600, OUI on 10,000 and NDD on about 9,800. There were a few others at considerable distances operating above 10,000 meters occasionally but these were the principal ones.

Consider the difference today. Practically every station with DX aspirations operates above 10,000 meters and the number is growing continually, not only in foreign lands but right here at home. There is NDD, WSO, WII, WKQ (and several more sisters) NSS, NPL, KIE, KET, LY, YN, POZ, LCM and many more, all with one exception operating between about 10,000 and 17,000 meters. This represents a difference in frequency of about 12,000 cycles, a difference approximately equal to the difference in frequencies between 200 meters and 202 meters.

Now if anyone can even hope to get results from distant stations who operate on waves between 10,000 and 17,000 meters with all the present nearby stations going at full blast, which they do practically all the time, he is due a sad disappointment. Not only are results from distant stations impossible but the nearby stations hetero-

dyne themselves so badly that it is even impossible to tune these in with any degree of success. Therefore the experience of "A Novice" in getting NAA much louder than NSS is nothing at all new but really the rule to all operating in the east, and if results are to be had at all you must hike out to parts where the QRM is dimmed by distance or else take special precautions in erecting loops, long directional wires, etc., as is done by the high power stations themselves. Results from ordinary amateur aerials are absolutely impossible at present.

The primary will have little effect on tuning when you are being heterodyned off the map. The same applies to short wave phone reception mentioned by "A Novice" where many phones going at the same time will heterodyne each other badly and cause poor results, and this is doubled and more when the receiver happens to be so located that it also picks up the heterodyne harmonic effects of the nearer high-power stations.

Receiving the high-power stations with a separate heterodyne is theoretically the best but the difference in actual practice is very slight and not enough to justify the burning of another tube.

Home-made coils, if properly made, will not only work better but look better than the usual small honeycombs for short wave lengths. As to the matter of tubes, no one with a practical knowledge of long wave work would ever think of securing high amplification under the best of conditions on long waves with a soft tube. Hard amplifier tubes are absolutely necessary for long wave detection.

However, I would advise "A Novice" and everyone else interested in long wave reception that reception at present above 10,000 meters is practically impossible with the average amateur aerials so far as obtaining good DX results goes. Before the days of C.W. transmitters spark stations in Europe, the Pacific Coast and Hawaii have been almost regularly copied on a crystal detector, which today is quite impossible due to the high power C.W. stations and their general blanket effect. Also the few C.W. stations that first made their appearance on the Pacific Coast and in Europe, such as OUI and KSS, could easily be copied on a crystal detector and a chopper. Try this now'days and see how far you get.

Should the experimenter happen to catch a time when all of the high power C.W. stations within 500 miles of him are closed down, then he will be able to receive Europe, Hawaii and perhaps greater DX, with as much ease as of old, but it looks like this condition will never again prevail. However no one should have much trouble receiving from "LY" at the present time. He is up on 23,400 meters by himself and does not share in the general heterodyne

effect and QRM between 10,000 and 17,000 meters. Also good results can still be had from FL who uses 6,700 meters approximately. When WSO and NDD are quiet, fair results can be obtained from LCM and POZ. OUI has moved up to about 14,000 meters so we no longer get him with any degree of success. Dozens of new ones have sprung up. Some I know nothing of, as it has been many a day since I operated a set above 10,000 meters due to the general failure of these waves to give results under present conditions and the greater interest of the short waves.

I thank you for indulging these explanations, and hope they will serve to clear up some of the mysteries of long wave reception as it exists today.

With best "73" to all, I am,

Sincerely,

A. L. Groves, 3BID.

Winnipeg Heard From

Canadian 4CE,

33 Rosewarne Ave., St. Vital, Man.

Editor, QST—

In all of the copies I have received of QST there has not been any correspondence from Winnipeg, so it is about time you had some. There is nothing very exciting going on up here on account of the summer weather and the usual QRN. At the time of writing there is an organization of "real hams and broadcast listeners" getting under way. The radio craze is just as bad here as it is in any other place, and the gang that turned up at the first meeting of the club gave every evidence that the organization will be a success. As soon as the club or association (we haven't decided which it is to be) gets things moving, you fellows in the States will hear more of the "Peg" than you heard last winter.

As our power up here is limited to $\frac{1}{2}$ K.W. and also to 180 meters (C.W. 200), any hopes of doing very much DX work are very small. Still you never can tell. Wonder how many of you hams listen for any of our sigs, eh? Perhaps you get them but don't bother to answer. There are a bunch of $\frac{1}{2}$ K.W. stations here, good ones too, that could handle traffic in proper style, if we can connect. C.W. is the only thing to get distance, we know, but what the Samhill are you going to do if you haven't got the shekles? Keep the old "rock crusher" on the job, that's all. There are hopes of one or two tube sets that will be in operation this winter. Yes, things are starting to show a little life here.

If any of you fellows in the States pick up our sigs, drop us a card; then we can tell what we can and cannot do. Most of the work is done after the broadcasting stations close down. That is after 10 P.M.

Yours truly,

Vincent Thomas.

Here's Where Radio Counts

Sandy Falls,
c/o Northern Canada Power, Ltd.,
Timmins, New Ontario, Canada.

Mr. A. H. Keith Russell,
Manager Ontario Division,
Toronto, Ont.

Dear Mr. Russell:

I have been going to write you for so long now that it has got to be a habit of letting the job be crowded out, so here goes.

Just want to tell you that I am back in the woods of Northern Ontario, in the Temagami Forest Reserve, Lat. 48 and Long. 81, on the Mettagami River in the Porcupine gold area. Have been fussing around an old wireless set for over a year on the receiving end, and have a couple of small transmitters as well. Was absolutely alone up this end of the world until a few months ago. No one worried much about radio at all. No other "ham" within 150 miles (Marshall of Temagami). Used to read your reports every month in QST and sigh with loneliness, then shove the wireless set off the table and build a better one. Have drifted all the well-worn route from the loose-coupler galena combination up to the two step and Reinartz, and wake up now every other night in a cold sweat about the "super regen" stuff—then get out of bed about 4 A.M. to put out the cat and fuss around in my shirt tail just to see who of the boys are still working.

Well, as I say, I got lonely, so began starting something in the local papers—little talks, etc., to see if there was anyone around here who would have the nerve to squeak up and say he was a "ham." Lordy! Lordy!—one guy wrote and said he was the real quill—and only SEVEN miles away! Fancy that and me a-pining back here amongst the balsams and spruce with a broken heart in one hand and a QST in the other. Consequently, I thereupon immediately proceeded in as decorous manner as possible to his domicile and upon seeing him, fell on his neck and wept with joy. I don't remember much else but folks tell me we had to be blasted apart after three days in order to give us sustenance. From then on things have progressed. I had found a kindred soul only SEVEN miles away, so the following day found me chopping an old dilapidated water closet box out of the ice, and hacking up the copper tank into a fifty foot strip for an O.T. Dug up a coil, key, condenser, gap etc., and cut loose. Nix! I prostituted the northern ether at 45° below for a week and all the wolves died within five miles of this camp. It was a riot! There must be something wrong. It looked as if I must be pounding right over my man seven miles away and going clear down to Texas—but no cards came. Then my aerial pole

blew down and did not have the heart to put it up again. Just tied it to an out-house at the far end, and went to the key—and poked away as usual to keep me from going "bluey." Two days later my ham drops a card to me that I was very QSA "just around where WNY comes in good"!!!

Oh me, Oh my—and my aerial five feet from the ground?!

So it went on—from that on up to a decent coil, interrupter, quarter K.W. quenched gap, R.F. meter, pushing out seven tenths of an amp or so, and tuning around 180 meters—you know how it goes. Went ahead and kept up the propaganda work and have about half a dozen with receivers all round me with a couple talking transmitter every time I get close enough to 'em. Have pushed the receiving end of the thing fairly hard myself, tried all the fool circuits that I ever saw or dreamt about, until I have chopped half a mile of perfectly good wire into little pieces. The nights find me fussing around with three or four receivers of different types, a bushel basket full of Groves, spider, D.L. coils, fil. voltmeters, milli. amm., verniers, and the cats pyjamas of a wave-meter that set me back a shade over a hundred fish alone. I am about 550 dead north of Toronto, yet I can honestly say I have never logged a CANADIAN HAM. Yet the walls here are plastered to the ceiling with cards from U.S. hams verifying reception. How come? As for radio-phone stuff, I rake in about a dozen U.S. stations ranging from KDKA to WHAF and 3XW.

WJZ pushed one of my letters to them into the New York Globe—the Pittsburgh Post followed suit—then nine magazines quoted it, Bruce Barton in the "American" magazine also, and the last I heard it had rambled into the "Radio Broadcast" advertisement which was selling an "Easy Home Radio Course" by Maj. Gen. Squier. Incidentally I might say that I was shovelling mail around from under my feet for ten days—all from girls in the U.S. wanting to marry me or asking delicate questions utterly remote from radio.

Oh,! how I raved to be single again,—just for TEN WICKED MINUTES!!! Well, let's go. What I started out in the first place to tell you was that I am going to put in ten or twenty watts C.W. Should be all set by Nov. 1st—in fact I have everything all ready such as the more important items like diagrams of circuit, newer dope which cans the diagrams, and so forth. All I need now to get ready are a few tubes, choke coils, meters, inductance, motor generator and one or two other odds and ends too trivial to mention. Well, all joking aside, I think you will find me on the mat along with the rest of the gang with ten or twenty watts and about 500 volts some-

where around the date above stated, sooner by Heck if the gods are kind enough to assist me in the amassing of sufficient toadskins to buy the junk.

Best of 73s from your truly,
M. J. Caveney,
Can. 3GG.

Full-Wave Self Rectification

Norfolk, Va.

Editor, QST—

Having just received the August copy of QST and having just absorbed the contents of Mr. A. M. Young's article on the "Operation of the Low Power C.W. Transmitter," I wish to take some exceptions to some of his statements concerning the efficiency of the self-rectification circuit. I am using this circuit with two fifty watters and am getting very good results. He says in his article that there is a great loss of power due to the fact that one of the tubes is idle while the other one is in operation, and I have also read another article in one of the back issues, written by some one connected with 1XM, that in some of their tests they found there was a negative potential applied to the tube which was not in operation during each half cycle, further killing it, the whole effect being a loss of power. From my own tests here, with one tube in the circuit, and the other one taken out of the socket, my antenna current on 200 meters was 2.25 amps and with the two tubes operating was 4 amps. Now how come, where is that "loss of power"? Have tried other circuits, all except the reversed feedback, and have found that none of them gave me the results that the self rectification circuit gives, and hope to try the reversed feedback circuit soon. I also had trouble with the keying and found that the remedy was to shunt the key with a one mfd. condenser, when using the key in series with the grid leak.

Respectfully,
3MK.

Ether vs. Magnetic Field

P. O. Box 278,
Livingston, Mont.

Editor, QST—

According to Webster, energy is "the power by which anything acts effectively to move or change other things or accomplish any result." This, together with other definitions easily shown, implies that energy is inseparable from matter. It is difficult or impossible to consider energy in any other way. Therefore we think of kinetic energy as a result of matter in motion, and potential energy as a property of matter under stress.

Light and other electromagnetic phenomena, such as the waves used in radio telegraphy and telephony, are indisputably forms of energy, and, according to the above generally accepted meaning of the

word "energy," must be results of some form of matter in motion. Science has long accepted this as a fact, and many have been the attempts to determine the form of matter essential to the observed results. As a composite result of these long-continued efforts the students of physics the world over have accepted, with reservations here and there, what is called the hypothetical ether. This is supposed to be a form of matter, more or less uniformly distributed thruout the universe, very different from all forms with which we are familiar. In fact, in order to meet the requirements as a transmitter of electromagnetic waves without interference with other physical activities, it must be widely different, and we are therefore fully justified in assuming that such is really the case.

If we think of the ether as we do of the forms of matter immediately familiar to us, we soon find difficulties in our attempts to co-ordinate it with electromagnetic energy and other forms of energy. Probably the chief objection to the hypothetical ether has resulted from just such mistaken view of the subject.

It has been stated that no such thing as this hypothetical ether can exist, because it calls for diametrically opposite properties. That is, if we think of it as we do ordinary matter, it must be throughout at the same time both extremely tenuous and extremely dense. Fortunately it is not necessary to think of the ether in this way.

The absolute need for a medium of some kind to account for various physical phenomena, including magnetism, electricity, propagation of electromagnetic waves, and gravitation has stimulated analytical mental effort so largely that we have several worthy results. None of these can be said to be wholly correct; but collectively they give us a fair basis for discussion.

In his efforts to understand the phenomena of gravitation, Le Sage, of Geneva, published during the year 1818 an hypothesis which is given in the Encyclopedia Britannica as follows:—

"Le Sage supposed that the universe was thronged with exceedingly small particles moving with very great velocities. These particles he called ultra-mundane corpuscles, because they came to us from regions far beyond the solar system. He assumed that these were so penetrating that they could pass through masses as large as the sun or earth without being absorbed to more than a very small extent. There is, however, some absorption, and if bodies are made up of the same kind of atoms, whose dimensions are small compared with the distances between them, the absorption will be proportional to the mass of the body."

In this way with further argument, Le Sage accounted for gravitation as a push

rather than a pull, or attraction as we are wont to express it.

If we give to Le Sage's corpuscles the additional properties of infinite or nearly infinite elasticity, motion in all directions with the speed of light, and inability to penetrate each other, we may find food for interesting speculation of a nature that might possibly give new and more definite information regarding the construction of the necessary medium conveniently called the ether.

With these additional properties Le Sage's corpuscles could not possess weight, possibly could not accomplish friction, and could not unite with each other alone to form masses. They might possibly be capable of forming various combinations with minute particles of some other unknown form of matter, to form atoms such as are cognizant to us. Thus, without much stretch of the imagination, Le Sage's corpuscles might become modern electrons under conditions as yet undemonstrated. Thus constituted and situated these particles might form the whole of a universal magnetic field, in conformity with Dr. Steinmetz' recently published theory. ["Popular Radio," page 161, July, 1922.—Ed.] Even if this be true or partly true, the writer can feel no need for abandoning the old name of the interstellar medium and all of our preconceived ideas regarding such medium.

If we accept, at least for the time being, these suppositions, we can reasonably deny some of the objections to the ether as advanced by those who think of it in terms of ordinary matter only. *Such a medium could easily be the great storehouse of the energy of the Universe.*

Any disturbance of the heterogeneous movements of the particles, which, as a whole, amount to homogeneity, could become evident as some form of energy known to us. Without some disturbance we could not be conscious of the presence of such matter.

Possibly we have two great divisions of matter; one form consisting of some such medium as that here assumed; the other possibly consisting of different minute particles likewise as yet not positively known to us. The former, for convenience, we might name negative matter. This we can reasonably assume to be unlimited in quantity. The latter, necessarily limited in quantity, we might name positive matter. Matter of which we are cognizant may consist of forms resulting from various combinations of these two primitive forms. This seems not largely at variance with modern views concerning the probable electrical constitution of tangible matter.

Objections may be offered to Le Sage's theory as well as to the suggestions and modifications of Le Sage's views given herein. In fact, "Clerk Maxwell (article

'Atom,' Enc. Brit., 9th ed.) pointed out that this transference of momentum from the ultra-mundane corpuscles to the body through which they passed involved the loss of kinetic energy by the corpuscles, and if the loss of momentum were large enough to account for the gravitational attraction, the loss of kinetic energy would be so large that if converted into heat it would be sufficient to keep the body white hot. We need not, however, suppose that this energy is converted into heat."

Here again the physicist is thinking in terms pertaining to known forms of matter only. However, Maxwell's mental grasp of these subjects has probably never been surpassed, and it behooves us to give his considerations and conclusions very careful attention.

In further reference to Maxwell's views, the following quotation from page 353, vol. 17, Enc. Brit., 11th ed., may be found to have bearings on the subjects discussed. "In 1873 James Clerk Maxwell published his classical 'Treatise on Electricity and Magnetism,' in which Faraday's ideas were translated into a mathematical form. Maxwell explained electrical and magnetic forces, not by the action at a distance assumed by earlier mathematicians, but by stresses in a medium filling all space, and possessing qualities like those attributed to the old luminiferous ether. In particular, he found that the calculated velocity with which it transmitted electromagnetic disturbances was equal to the observed velocity of light; hence he was led to believe, not only that his medium and the ether were one and the same, but, further, that light itself was an electromagnetic phenomenon. Since the experimental confirmation of Maxwell's views by H. R. Hertz in 1888 (Weid. Ann., 1888, 34, 155, 551, 609; and later vols.) they have commanded universal assent, and his methods are adopted in all modern works on electricity and magnetism."

Maxwell does not here state that his medium is simply a universal magnetic field, and that it is material in constitution; but, by inference, it may be that we are justified in assuming that such was his opinion. He does not claim that there is no such thing as the ether. He simply, modestly, and in otherwise seemly manner states that: "He was led to believe, not only that his medium and the ether were one and the same, but, further, that light itself was an electromagnetic phenomenon." Hertz' subsequent undeniable demonstration gives to Maxwell's views on these subjects a stability that cannot be safely denied.

The results of these labors of Maxwell and Hertz cannot be considered except as among the most signal achievements to be found in the annals of science.

From the foregoing considerations, as well as others that may not be convenient-

ly recorded at this time, it appears to the writer that there must be and really is a medium of some kind filling all so-called space, conveniently named the ether; that such medium is electromagnetic in character; that it may in reality be simply a universal magnetic field; that a magnetic field is a thing of substance; and that we need not abandon the old and convenient name applied to this medium nor all of our preconceived ideas on the subject.

Cordially yours,
James E. Stuart, M.D.

(Editor's Note: By comparison with this subject the discussion on power factor which raged in *QST*'s columns over a year was child's play. That makes this all the more interesting. Dr. Steinmetz has discredited the theory of the hypothetical ether and substituted in its place an equally hypothetical universal magnetic field. A.R.R.L. members who are familiar with the subject are invited to express themselves. There are some of us who feel we just cannot get along without our ether, and object to having it ruthlessly eliminated. Dr. Stuart takes up the cudgels in defence of our present conceptions. Our columns are open to anyone desirous of expanding Dr. Steinmetz' concept in reply.)

Misrepresentation

Indianapolis, Ind.

Editor, *QST*—

Just finished reading your article entitled "Your Pen In Hand," so I am going to do my bit. The article I am going to write is one which deserves the support of every A.R.R.L. man.

I have been connected as chief engineer to a well-known radio company in the Hoosier state and was attached to a branch office to render whatever assistance I could to the manager. The first duty I had to perform was to accompany him and give a demonstration to a body of about one hundred and fifty farmers. After the set was in operation and WWJ was coming in strong, one of the natives asked the manager to get some other station. And how did he do it? He walked over to the set and gave the dial one complete turn, which brought it back to the same position, and replied "All you have to do is turn the dial to the desired transmitting station." When he had turned the dial he said "This is WGY"—yet in reality it was still WWJ. He did this several times, naming KDKA, KYW, WSB, WEAU, and in fact nearly all the leading stations. All this time I was standing by. Then 8ZZ started calling 8ZY and the manager turned to the audience and said, "Is there anyone here who understands code?" Of course no one did. So he said, "That is a boat in the Atlantic Ocean." And he even went so far as to

state, when KDKA was broadcasting Arlington time, that it was POZ sending time.

Now, men, let's rise up and drive birds of this feather from good old Radio. This man had never seen a set until six months ago. He is killing radio and making enemies for us, we who are ever ready to lend every available assistance to the beginner. Altho this matter hasn't hurt us yet, it is going to. I lost my position fighting this misrepresentation. But after operating three years in the commercial game and owning an amateur station for nine years, there's no one going to ruin the greatest game in the world if I can stop him.

Yours sincerely,
A Fighter for Radio
(Late of the 6th District.)

(This is a matter, fellow A.R.R.L. members, in which we can be of service to our art. Let each of us do his best to discourage misrepresentation in radio. If we had been the writer of the above letter we would have been strongly tempted to tell the assembled farmers just what particular variety of liar this radio "expert" was. Let's make the other fellow play the game straight too.—Ed.)

Re Canadian Aluminum

Lisnadil, Ava Road,
Brantford, Ont.

Editor, *QST*—

The Canadian associate company of the Aluminum Co. of America is the Northern Aluminum Co., Ltd., Bank of Hamilton Bldg., Toronto. In a communication from them dated Aug. 5th they quote flat sheet aluminum 1/16 in. thick, at 40¢ per lb., f.o.b. Toronto works. Delivery is within approximately two weeks from receipt of order.

This material weighs .892 lbs. to the square foot, and is made up of aluminum 98 to 99% pure.

Hoping this will be of some value to the fraternity,

Yours sincerely,
Stephen M. Jones, 3CT.

More Beverage Results

Vashon, Wash., 8/15/22.

Editor, *QST*—

Herewith is a list of C.W. stations copied at my station on a 1500 ft. Beverage wire (galvanized iron—hi!), home-made Paragon set, and 2-step A.F. amplifier. Have heard all districts but the first.

The use of Beverage wire reduces the number of controls of a 3-circuit tuner to the grid and plate variometers, as there are no changes in the open circuit after the right amount of inductance is found, and no change in coupling is necessary—

use quite tight. I get better results with the 3-circuit than with a Reinartz and with no more controls either.

Yours truly,
D. A. Cutler, 71Y.

Calls Heard July 16 to Aug. 14, all C.W.

2FP, 3BLF, 4BV, Can., 4EX, 4KF, 4MW (QRA?), 5AE, 5DI, 5DO, 5QI, 5LA, 5JL, 5ZG, 6ALU, 6ARC, 6APW, 6ARB, 6BQZ, 6BQC, 6EN, 6GR, 6KA, 6NX, 6RR, 6ZF, 6ZAF, 6ZX, 7AEA, 7DD, 7LU, 7MF 7NA, 7OZ, 7SY, 8ACF, 8AFY, 8ALT, 8AQO, 8BEF, 8CPX, 8OW, 8SB, 8UE, 8ZAG, 8ZZ, 9AMA, 9AMB, 9AMI, 9ABV, 9AJA, 9AOZ, 9APW, 9AVZ, 9AYS, 9AON, 9AUA, 9BFG, 9BGH, 9BAF, 9BCU, 9BSG, 9BZI, 9DR, 9DTM, 9ZAC.

Ammeters vs. Voltmeters

3661 Michigan Ave.,
Chicago, Ill.

Editor, QST:

In the endeavor to control our vacuum tubes properly, it seems to be admitted that instruments are of value. As to the use of voltmeter and ammeter, however, we find some difference of opinion.

It seems logical to use a voltmeter for control of transmitting tubes, because here we wish to work our filament at the maximum temperature, so that we can get the most out of the tubes. Tubes cost money and we are after amperes in the aerial and know that the higher we can work the filament consistent with a reasonable life, the better. It is quite evident that by working at constant voltage we maintain a more nearly constant current density in the filament over its entire life than by working with constant current.

However, it does not seem that the same facts apply in the case of receiving tubes. Here we do not necessarily wish to work at the highest filament temperature possible because we are not looking necessarily for maximum filament emission. What we really do when we use instruments on receiving tubes is to note the point of best operation, provided that it is under the tube rating, and simply duplicate these values each time the current is turned on. For this reason it would seem that either current or voltage control could be used because the instrument would be used more to duplicate the previous setting than to actually work the tube at any definite point given by the manufacturer.

Now, since this is the case, it would seem that an ammeter were really the better instrument to use, since the ammeter always records what is going through the tube, whereas the voltmeter records the voltage at the terminals of the socket and poor contact due to dirty terminals on the tube may quite possibly cause an increase in voltage

on the instrument where it really does not apply on the tube itself.

I have been using current control on the receiving tubes in my set, on both detectors and amplifiers and it certainly seems to be the proper sort of control. I should like to hear from others in this regard, as it certainly seems that vacuum tube operation requires the use of either constant current or constant potential or something to be kept constant in line with ordinary engineering principles.

Yours very truly,
R. O. Miles

Northern Lights

West Chester, Pa.

Editor, QST:

I hope you can grant me a line or two in your valued paper to say a word in connection with the letter from the Westinghouse Elect. & Mfg. Co., by C. W. Horn, in a recent issue of QST.

I would like to draw Mr. Horn's attention to the logs of coast stations in Alaska. He says the "Northern Lights" do not affect radio. I agree with him. They *don't* affect it, *they put it out of business*, from the volume of static that rolls in. I have taken ships up to Alaska and experienced very heavy static, just like the Gulf of Mexico in summer. Several nights this past spring I have seen the "Lights" and on these evenings the static "boiled." This latter case was in New York City.

Yours sincerely,
Paul G. Watson, 3BV.
214 West Barnard St.

Storage B Batteries

Kansas City,

Editor, QST:

About every now and then there is an article in different magazines on "how to make a storage B battery," but when we try to make 'em it's a different proposition. At least we gain a lot of knowledge in "can'ts" from following the writers' instructions even if we don't get any B bats. made.

The trouble with plain lead strips is they won't "form" and they won't charge, and they last about one hour. The trouble with Edison cells is they are hard to get, expensive and require weeks of labor. The trouble with making them out of prepared lead plates is one that we have all experienced. The positive plates simply will not cut up without crumbling to pieces.

Get your test tubes, assemble them in a rack, then get a bunch of *negative* storage battery plates. Used ones, if in good condition, will do. Cut them up into strips just wide enough to go in the test tubes and connect together with lead strips. Give them about a 12 or 15 hour charge at a 1

amp. rate, and your plates are "formed." The negative plates can be cut with tinsnips without crumbling, and when "formed" work as well as when one uses positive plates instead.

The 72 volt storage battery at 9DRQ has been in operation for 4 months and gives highly satisfactory service on the two tubes used. My bulbs are on an average of 4 hours per night, and it was 3 months before this battery needed recharging, which I did with a chemical rectifier.

A word as to connecting the strips. Pure lead connectors must be used, as solid wire solder easily breaks at the connection. Cut your lead plates clean on the end to be connected and apply a hot (soldering) iron at the side, and the plate and connecting strip will make a solid, clean connection. It is hard at first to do this but the knack is soon acquired.

Above all, care for this battery just as you would your A battery.

J. Olsen, 9DRQ.

P.S. This 72 volt battery cost me a little more than a 22 volt battery of the dry cell type and has already outlived one set of these.



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After the iron core is assembled and the transformer sealed, each transformer is given an actual circuit test in a radio amplifier; the gain in signal strength being noted over that of the detector tube alone and required to meet the gain of our standard laboratory model.

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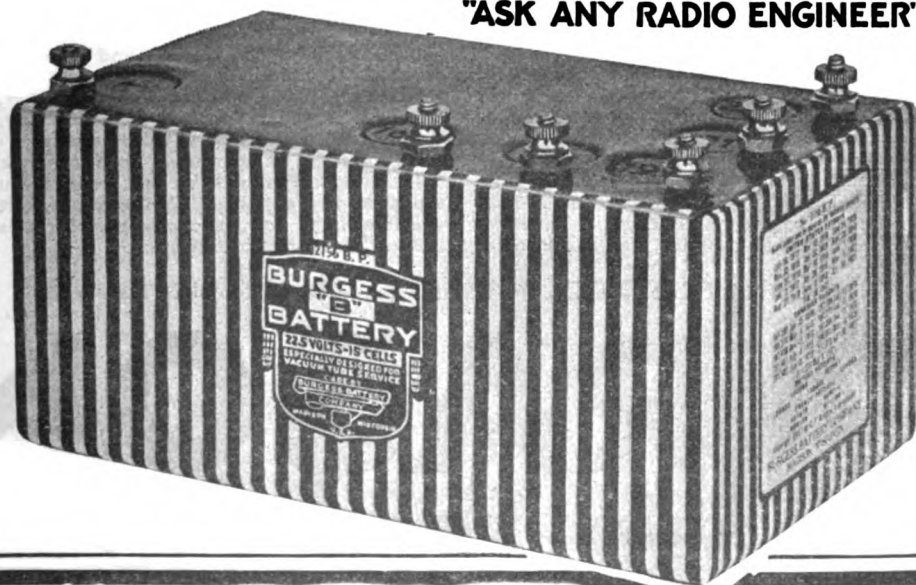
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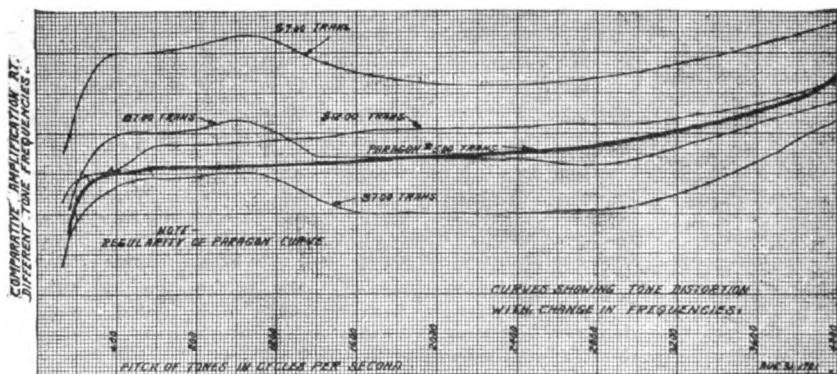
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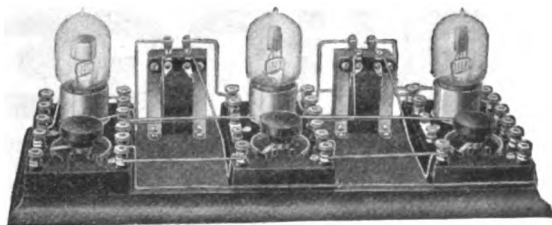
The Curves Show Why



Curves Showing Tone Distortion with Change in Frequencies

Unless the Amplifier Transformer favors *all tones in exactly the same manner*, distortion will result. Notwithstanding their high prices some of the transformers whose curves are

shown above are totally unsuited to radio-phone reception. When you build use PARAGON, the same as is used in the Famous Paragon DA-2 Amplifier.



A Home-Built Paragon Amplifier

This illustration shows PARAGON VT Controls (Price \$6.00) and the PARAGON Amplifier Transformer (Price \$5.00) built into a Detector two step unit. The combination gives you a handsome high-grade instrument, low in price but highly efficient and absolutely without distortion.

PARAGON VT Controls (Patented) may be used to control vacuum tubes wherever they are used as detector, oscillator, trans-

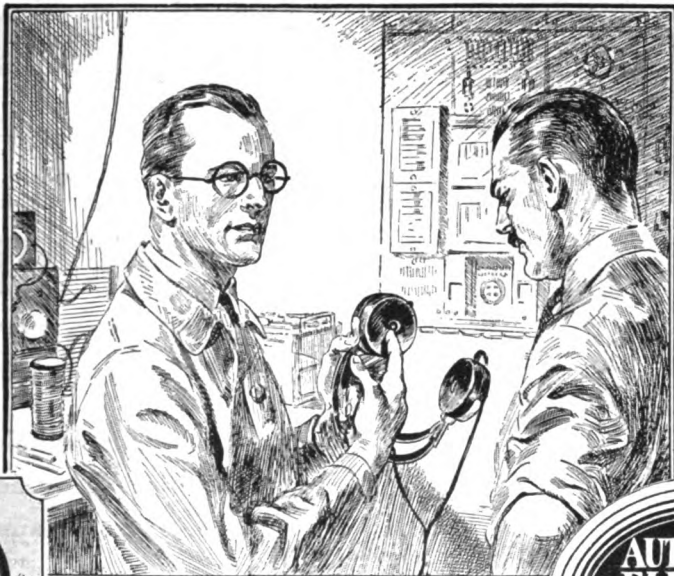
mitter, and in cascade for radio and audio frequency amplifiers. An extremely useful and good looking unit. Comprises standard socket, famous PARAGON rheostat, grid condenser, provision for grid leak and all necessary circuit terminals. If your dealer does not stock these Paragon Products, we will see that you are promptly supplied. Write for booklet which will tell you the many uses for this efficient and compact mounting.

ADAMS-MORGAN CO., 4 Alvin Ave., Upper Montclair, New Jersey

PARAGON

Reg. U.S. Pat. Off.

RADIO PRODUCTS



"A Little Knowledge
Is a Dangerous Thing"

AND that's the truth which applies to the business of making Radio equipment. It is something to think about when you buy Head Sets.

There are two kinds of manufacturers of Radio head sets—those who know little or nothing of telephone design—and concentrate their efforts in quick production regardless of quality. And then there are those who know the business through years of experience and who place *scientific design and quality* above everything else. So this is a plea for the good of the industry — and for your protection.

Specifically — these Automatic Electric Head Sets have been developed by telephone engineers who've devoted more than



This is the high grade plug that comes attached, when desired, to Automatic Electric Head Sets. It will take care of any kind of cord terminals, will fit any kind of jack and will accommodate two head sets. With this plug attached to our head set you can be sure the head set is properly "poled."

thirty years of effort to the designing of better telephone apparatus. The time spent in the perfecting of this improved receiver is shown by the remarkable results which are produced under all conditions.

It has many distinctive features which prove its superior effectiveness. The powerful single pole electro-magnet and complete soft iron magnetic path—assure perfect clearness of both weak and loud signals. No distortion or foreign noises — whether used with crystal, V. T. detectors or multi-stage amplifiers.

If your dealer handles Radio equipment of the finest quality he is familiar with the Automatic Electric Head Sets. Ask him.

If your dealer cannot supply you, we will send you a complete Head Set, postpaid, for \$10.00 — with plug attached \$11.50.

Automatic Electric Company

ENGINEERS, DESIGNERS & MANUFACTURERS OF THE AUTOMATIC TELEPHONE IN USE THE WORLD OVER
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"As good as Brandes"

Only if a headset bears the name Brandes can it be "as good as Brandes."

And genuine Brandes *Matched Tone* headsets cost no more than less sensitive and less rugged imitations.

Send ten cents in stamps for the "Beginner's Book of Radio," which explains radio in terms that anyone can understand.

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International Electric Company,
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C. Brandes, INC

"Matched Tone" Headsets

237 Lafayette St., New York

Made in Canada by
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VERNIER RHEOSTAT

With Individual Knobs for Rough
and Vernier Adjustment. Greatly
Improves Your Filament Control.



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Fool proof spring contacts.

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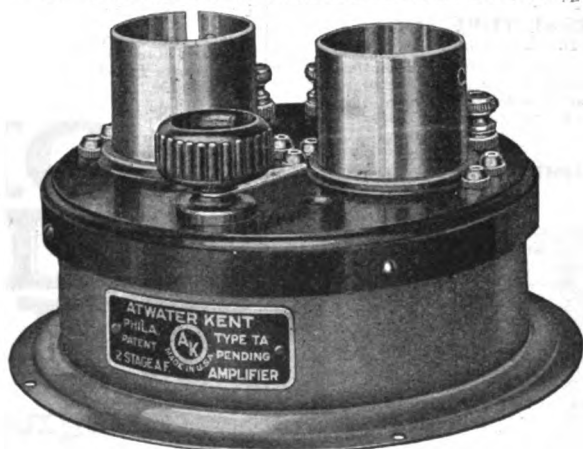
502 W. HURON ST.

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ATWATER KENT

2-STAGE AMPLIFIER



Price \$16⁰⁰

THE OUTSTANDING *Advantages* OF THIS INSTRUMENT *are*

- ¶ Excellence of reproduction.
- ¶ Amplification regulation by small steps.
- ¶ A complete instrument in itself.
- ¶ Compactness
- ¶ Regulation entirely by knob, no jacks to equip.
- ¶ Transformers protected by steel housing.
- ¶ Short wiring connections eliminate capacity effect.
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THE LOW PRICE IS MADE POSSIBLE AS A RESULT OF
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OF SCIENTIFIC ELECTRICAL INSTRUMENTS

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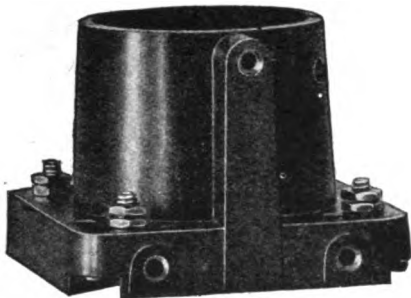
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PHILADELPHIA, PA.

Radak

Trade Mark Reg. U. S. Pat. Off.
Parts that are leaders in their lines



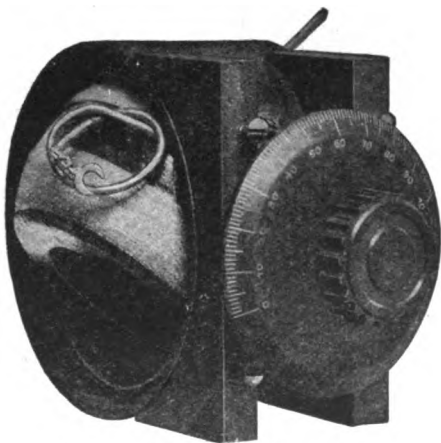
Type H T

RADAK UNIVERSAL TUBE SOCKET

Moulded In One Piece

Made of condensite, without the usual objectionable metal tube. Designed to mount easily on back of panel, requiring neither shelf nor brackets. Quickly screwed to any flat surface. Binding posts on base. Also holes outside each contact spring for using soldered connections. Fills a great need of the amateur.

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Type H.R.V.

RADAK VARIOMETER

Cuts Down Dielectric Losses

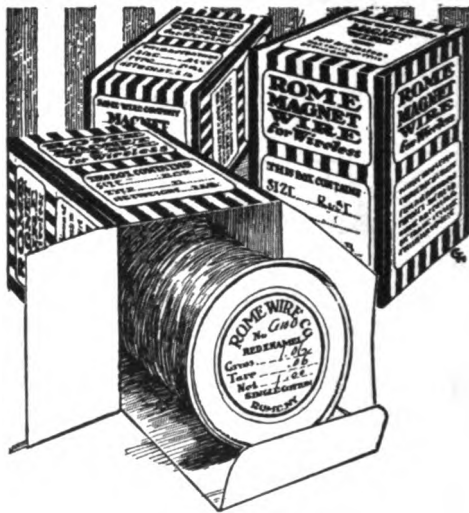
Ball of hollow moulded hard rubber; outer shell of bakelite. Inner winding firm on ball. Outer winding formed in section of sphere. Clearance small, giving wide range of wave-length. Dielectric material reduced to minimum. Unusually long inductance range for size of instrument. May be rotated continuously without breaking contact. Furnished with 3 in. dial and knob.

PRICE, COMPLETE \$6.50

Each of the parts shown separately here is one good reason why Radak Receiving Sets are giving such satisfaction. Each embodies the long experience of the Clapp-Eastham Company, and is a unit used in Radak Sets. Sold separately for the benefit of amateurs who construct their own sets. A Radio Catalog showing other parts, as well as the latest Radak Receiving Sets, 6¢.

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105 MAIN STREET, CAMBRIDGE, MASS.
Oldest and Largest Makers of Radio Equipment
Established 1906



For satisfaction
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All sizes; 1/4-lb. to 40-lb. packages.

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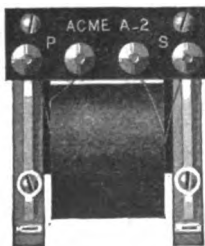
“Why the menagerie?”

YOU wouldn't stand for a young menagerie howling around the house. Why permit your radio set to act that way? It's unnecessary. For just five dollars you can add an Acme Audio Frequency Transformer to your set. This ends the howling and distortion so prevalent in the ordinary detector unit and at the same time it greatly increases the volume of incoming sound. Music and the human voice assume their natural tones. No more thin, squeaky voices and tiny elfin wails.

You will also want the Acme Radio Frequency amplifying Transformer. You can use it with either a vacuum tube or a crystal detector set. It greatly increases the distance over which you can receive broadcasting programs. Just the same price as the Acme Audio Frequency

Transformer. Two stages of Acme Audio Frequency Amplification with two stages of Acme Radio Frequency Amplification will give you maximum range, volume and certainty of natural tone. Your set is incomplete without them.

The Acme Apparatus Company (pioneer transformer and radio engineers and manufacturers) also make detector units, detector and two stage amplifying units, the Acme Clear Speaker, the Acme phone, also C. W. and spark transmitting apparatus. Acme Apparatus is for sale at radio, electrical and department stores. If one is not close at hand, send money direct. Ask also for interesting and instructive book on Transformers. The Acme Apparatus Company, Cambridge, Mass., U. S. A. New York Sales Office, 1270 Broadway.



Type A-2 Acme Amplifying Transformer
Price \$5 (East of Rocky Mts.)

ACME

for amplification



IF ALL the Manhattan Radio Headsets that have been manufactured and sold since the first one was produced on March 20th, 1922, were placed side by side, they would stretch in an unbroken line eleven miles long.

This means quantity production—and quantity production assures you of four things:

1. **Uniform Quality of Product.** Quantity production demands absolute uniform quality of raw materials. Only the very best materials are uniform in quality.
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3. **A Correctly Designed Product.** The proper design of the Manhattan Headset and the use of special tools, only possible in quantity production, enable us to add refinements and extra features at no increased manufacturing cost.
4. **A Quality Product at a Quantity Price.** Quantity production cuts labor costs.

This enables us to offer Quality Headsets at a Quantity Price.

Manhattan Radio Headsets are on sale by all reliable radio dealers. If he hasn't them in stock he will get them for you.

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\$6.00



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3000 ohm

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Recharge Your Battery at Home

Charges both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a **Valley Charger** and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge it or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parallel so that they can also be charged.

SATISFACTION GUARANTEED.

If your local distributor cannot supply you, write direct to

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Department Q, ST. LOUIS.

- - - - - Mail the Coupon - - - - -

Valley Electric Co., Dept. Q, St. Louis, Mo.

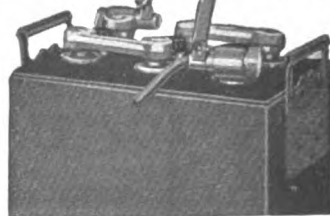
Gentlemen: I am enclosing money order (or check) for \$18.00, for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory, I will return it and get my money.

Name

Address

\$18.00

F.O.B. St. Louis





Scene from the Opera "Faust"

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the Radio
World

MOMENTOUS events in the arts and sciences are the result of rising above out-worn principles, independent of the tools of mediocrity. Beginning where others have been content to finish, a forward-looking group of radio engineers, comprising the Mu-Rad Laboratories, have designed and successfully constructed radio apparatus which is as advanced as the twenty-one-jewel watch is over the key-winder. Prices of this apparatus insure that great numbers will benefit from their achievements. Descriptive literature upon request.



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NEW JERSEY



THE day in and day out efficiency of this inexpensive De Forest Radiohome Receiver with its range up to 100 miles is just a straw that shows which way the wind blows. Anything marked De Forest lives up to the reputation of that great name.



**Na-ald
Small Space
V. T. Socket**

35c each, 3 for \$1.00, Moulded genuine condensite. Requires but small space for mounting. Readily accessible binding posts. No excess metal to interfere with efficiency. Unaffected by heat of bulbs or soldering iron. Phosphor bronze contacts. Nickel plated brass binding screws. Slash cut slot. Price possible because of large production.

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"EURACO" PRODUCTS

(Guaranteed)

**Compact — Interchangeable
Most Efficient — Accurate:**

60
Cents
per
Unit



60
Cents
per
Unit

**Mica Condensers — Grid Leaks
Mountings:**

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Dog
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TUBE"**



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***One of a Group of
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Radio instruments
described in Circular J***

Essential-- for GOOD Reception

Gives you your proper voltage instantly—thus greatly simplifies exact tuning. Saves its cost over and over by eliminating hazardous guesswork and making it possible to get doubled or trebled life out of each tube. A premature tube "burn-out" is practically an unknown occurrence with a Weston Voltmeter—if you use it properly.

Your dealer can supply you, or if he cannot, we will. Don't take a substitute if you want best results. Write for Radio Circular J.

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Makers of Electrical Instruments since 1888

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"STANDARD" The World Over
**ELECTRICAL
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VARIABLE CONDENSERS

43 Plate	-	\$2.95
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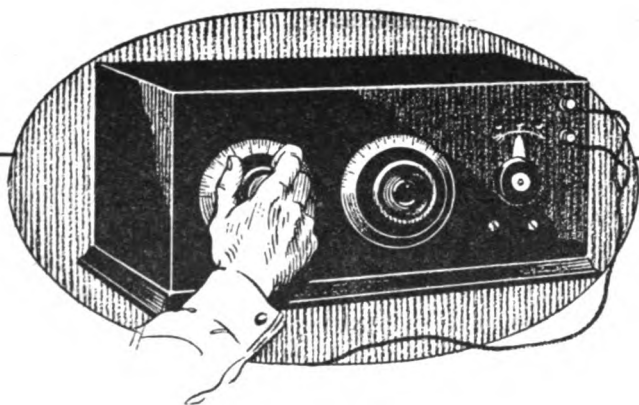
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BAINES ELECTRIC SERVICE CO.

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You can get the best insulation *now!*

ANY dealer can get Formica quickly now so there is no longer any need to use an insulation in which you have less confidence.

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When you insist on Formica you get an insulation that is approved by the navy and signal corps—and one that is known by the makers of the finest radio apparatus as being leak-proof, warp-proof, and remarkably uniform in insulating quality.

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That is why it is the most popular of all radio insulating materials.

DEALERS: We have many valuable dealer helps. Store cards, folders, plates for advertising. Call on us for co-operation.

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FORMICA

A Laminated Phenolic Condensation Product
SHEETS TUBES RODS

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Lines of Force

Crosley Radio Receiving Apparatus

LINES OF FORCE to an electrician mean the invisible magnetic field set up about a magnet or coil of wire carrying an electric current. Were it not for these **LINES OF FORCE**, wireless communication would be impossible.

LINES OF FORCE to a manufacturer are the invisible field of Favorable Opinion set up about his product which insures steadily increasing sales. It is only when a manufacturer places on the market articles of real merit at a legitimate cost, that his **LINES OF FORCE** become established.

The **LINES OF FORCE** created about **CROSLEY** Radio Instruments have made them the most attractive buy in the Radio field today. Study carefully the descriptions and prices on the opposite and four succeeding pages and you will see why **CROSLEY** instruments carry with them the invisible **LINES OF FORCE** that overcome and break down sales resistance. Then:

SEND FOR CATALOG

DEALERS & JOBERS:—If you offer **CROSLEY** Apparatus to your trade, you will be working with the **LINES OF FORCE** instead of against them. The demand for **CROSLEY** Instruments is increasing by leaps and bounds. Write for our attractive discount sheet.

CROSLEY MANUFACTURING COMPANY

♦ ♦ DEPT. QST. 2

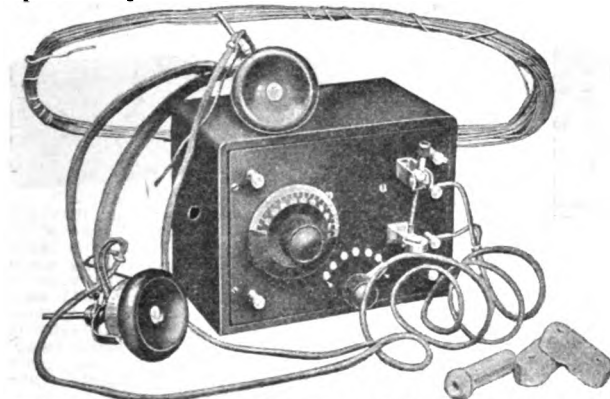
CINCINNATI, O.

CROSLEY RADIO APPARATUS has been recognized as the standard of value at a moderate cost. Our efficient staff of engineers has simplified these instruments so that they can be installed and operated by a novice.

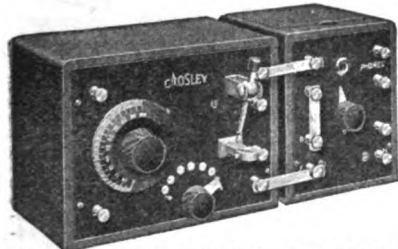
CROSLEY



CROSLEY AUDION DETECTOR UNIT. While this unit may be used with practically any type of tuner, we recommend it especially in combination with the **CROSLEY CRYSTAL RECEIVER MODEL 1.** It is designed to be operated with almost any crystal detector set. It will increase the range of a crystal outfit to about a hundred miles. One user in Minnesota hears Pittsburgh and Schenectady. The Combination is equivalent to our **HARKO SENIOR MODEL V.**
Price without tubes, batteries or phones\$7.50



CROSLEY CRYSTAL RECEIVER MODEL 1. Complete with head phones, antenna and insulators, ready to install without additional equipment. Will receive wave lengths from 200 to 600 meters and has a range of 25 or 30 miles. It has been known to receive up to 200 miles. Beginners in Radio will find this a very efficient unit. It can be used with any of our special units to increase the range and volume.
Price\$25.00



Showing the **CROSLEY CRYSTAL RECEIVER MODEL 1** attached to a **CROSLEY AUDION DETECTOR UNIT.** This arrangement changes the principle from Crystal to Audion and the detector stand must be eliminated from the remainder of the circuit. The accompanying photograph shows how this is accomplished by the simple connection of the binding posts. The upper and lower posts are connected, as are the middle posts on the left side of the detector unit. "A" and "B" batteries and one detector tube are needed in the operation of the outfit.



CROSLEY HARKO SENIOR MODEL V is a combination of the two units opposite in one cabinet. It makes a very neat and compact arrangement of a combination tuner and audion detector. We are confident that you will find nothing better on the market at any price. Price without tubes, batteries or phones.....\$20.00



CROSLEY RADIO FREQUENCY TUNED AMPLIFIER. This unit can be used with practically any type of Audion Detector Outfit, and is especially recommended for use with a combination of crystal receiver and audion detector, or **HARKO SENIOR MODEL V.** It is the feature of all of our larger units.

Being of our own design, we are proud of it. The R. F. T. A. not only amplifies the signals before they reach the detector, enabling it to work more efficiently, but also makes sharper tuning possible and eliminates interference to a wonderful degree. Will add at least six times the volume and range. Price.....\$15.00



Showing a combination of the **CROSLEY CRYSTAL RECEIVER MODEL 1,** **THE CROSLEY AUDION DETECTOR UNIT** and a **CROSLEY RADIO FREQUENCY TUNED AMPLIFIER.** It is equivalent to the **CROSLEY RECEIVER MODEL VI** shown on the next page. See that description. Dealers and Jobbers everywhere. If your dealer does not handle CROSLEY instruments write us direct.

Write for Catalog

CROSLEY MANUFACTURING CO.

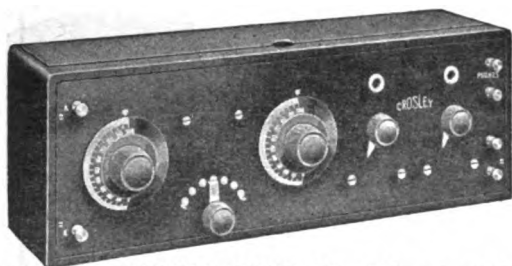
DEPT. QST 2 CINCINNATI, OHIO

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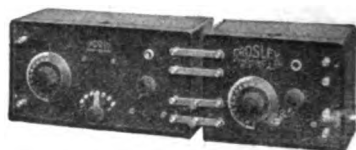
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CROSLEY

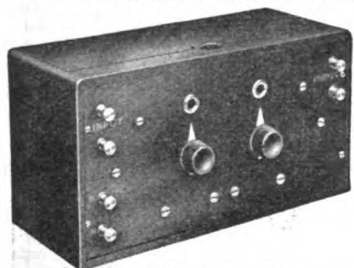
A wire from the house top to a nearby tree or building for antenna. A connection to the radiator or water pipes for a ground. Connect these to a CROSLEY set and you are ready to receive music, news reports, sermons and what not by the turn of a dial.



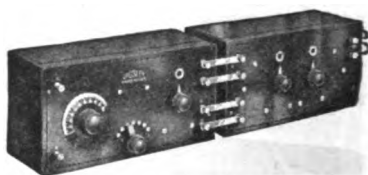
CROSLEY RECEIVER MODEL VI. This set consists of one stage of Tuned Radio Frequency Amplification and Audion Detector. It is normally for use with head phones but is especially recommended for use with any type of loud speaker. Additional amplification is unnecessary if head phones and horn are used in receiving local stations. It is equivalent to the combinations opposite and on the preceding page. Price without tubes, batteries or phones.....\$30.00



Showing a combination of the CROSLEY HARKO SENIOR, MODEL V and R. F. T. A. UNIT. This combination is made simply by connecting the binding posts directly across. An amplifier tube is used in the HARKO SENIOR UNIT with the grid leak and condenser bridged or short circuited. The detector tube is then placed in the radio frequency tuner. Thus this new unit contains the radio frequency tuner and the detector tube and its control.



CROSLEY TWO-STAGE AUDIO FREQUENCY AMPLIFIER. With this unit, two stages of audio frequency amplification can be added to any type of radio apparatus. Can be used in conjunction with the CROSLEY CRYSTAL RECEIVER MODEL I and CROSLEY AUDION

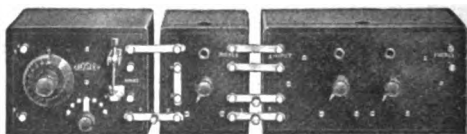


CROSLEY HARKO SENIOR MODEL V AND TWO-STEP AMPLIFIER. The working qualities of each of this combination have been described separately. This combination is not only equal in efficiency but the total cost of the separate units is lower than that of any other three-tube outfit. The controls are simple and are very limited in number requiring very little skill in accurate adjustment.

DETECTOR UNIT, CROSLEY HARKO SENIOR MODEL V, CROSLEY R. F. T. A. or CROSLEY RECEIVER MODEL VI. This unit increases the volume about one hundred times. Designed to match up uniformly with the above mentioned units. Without tubes, batteries or phones.....\$25.00



CROSLEY RECEIVER MODEL VI AND TWO-STAGE AMPLIFIER. This combination is equivalent to the CROSLEY RECEIVER MODEL X shown on the next page. With this combination, ship and shore stations on the Atlantic Coast easily are copied in Cincinnati, while radio telephone concerts and voice from Pittsburgh, Detroit, Chicago, Newark, N. J. and many other broadcasting stations are easily picked up.



CROSLEY CRYSTAL RECEIVER MODEL I, AUDION DETECTOR AND TWO-STEP AMPLIFIER. This Combination is the same as the HARKO SENIOR and TWO STEP AMPLIFIER hooked together. It is exceptionally efficient in the reception of signals broadcasted on the average wave length.



CROSLEY CRYSTAL RECEIVER MODEL I, AUDION DETECTOR, R. F. T. A. UNIT AND TWO-STEP AMPLIFIER. These various units hooked up, provide the same receiving instrument as the CROSLEY RECEIVER NO. X shown on next page.

Dealers and Jobbers Everywhere. If your dealer does not handle Crosley instruments, write us direct.

Write for Catalog

CROSLEY MANUFACTURING CO.

DEPT. QST 2

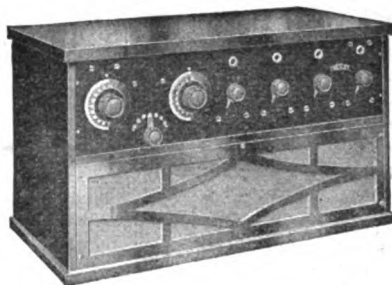
CINCINNATI, OHIO

CROSLY INSTRUMENTS not only incorporate every refinement of detail in the mechanical features but we are offering you beautiful pieces of furniture as well. Glance over the cabinets on this page and see for yourself.

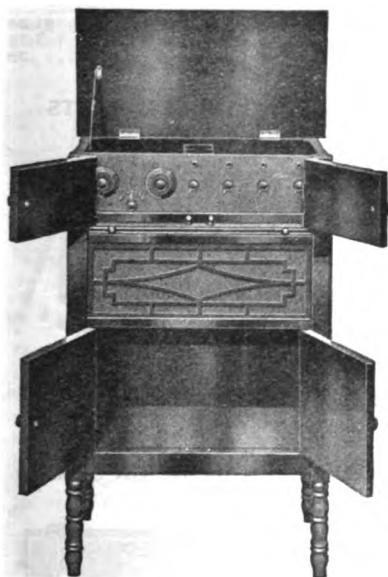
CROSLY



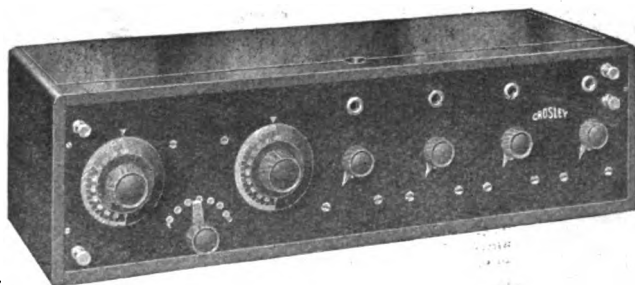
Showing a combination of the CROSLY HARKO SENIOR MODEL V, a CROSLY R. F. T. A. UNIT and the CROSLY TWO-STEP AMPLIFIER. It is equivalent to the CROSLY RECEIVER MODEL X and the combination on the preceding page. The High Efficiency and low cost of this combination make it one of the most popular instruments on the market to-day.



CROSLY RECEIVER MODEL XV. This receiving set is the same as CROSLY RECEIVER MODEL X, with the addition of a special sound resonating chamber for use as a loud speaker in connection with a pair of head phones. The addition of this sound resonating chamber is a feature that appeals to many persons. With it, every person in a room is usually permitted to hear the music or signals that are being received. Often it will be found that the entire house is filled with music broadcasted. Mahogany finished cabinet without tubes, batteries or phones.....\$70.00



CROSLY RECEIVER MODEL XX. Crosley Receiver Model XX is the CROSLY RECEIVER MODEL XV in an upright cabinet. A hinged lid when raised, allows the operator access to every part of the receiving apparatus. The doors, both upper and lower are also hinged. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Wires lead from the binding posts on the receiving set to the batteries in the lower compartment. Music received on this instrument will be heard throughout a large room and often throughout an entire house, the latter feature depending upon the power of the broadcasting station. Mahogany finished. Without tubes, Batteries or Phones.....\$100.00



CROSLY RECEIVER MODEL X is a combination of MODEL VI and the TWO-STAGE AMPLIFIER in one cabinet. In placing this Receiver on the market, we are offering you a unit whose range, volume and selectivity is remarkable. Nothing can compare with it at twice the price. Developed in the CROSLY Laboratories, this unit is absolutely the last word in Radio Receiving Apparatus. Used with head phones and loud speaker, it will bring in distant stations all over the house. Price without phones, batteries or tubes\$55.00

If your dealer does not handle CROSLY instruments, write us direct.

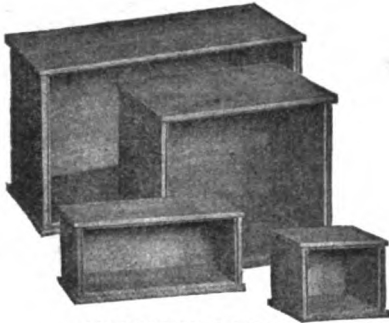
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CROSLY MANUFACTURING CO.
DEPT. QST 2 CINCINNATI, OHIO

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

101

CROSLEY

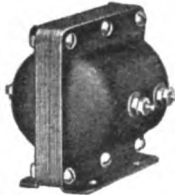


CROSLEY RADIO CABINETS

Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish and of the best workmanship. The CROSLEY RADIO CABINETS are made of hard wood, mahogany finish. Live dealers handle them—prices and sizes in our catalog.

CROSLEY SHELTRAN

Incorporated in the design of the CROSLEY SHELTRAN, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The CROSLEY SHELTRAN is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.
Better—Costs Less—\$4.00



CROSLEY BINDING POSTS

These are made in three sizes— $\frac{1}{8}$ " diameter, $\frac{1}{4}$ " diameter and $\frac{1}{2}$ " diameter. They are all of the same design, however, as shown in the illustration.

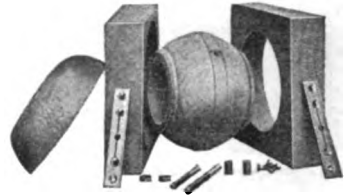
No. 1.....	5¢	each
No. 2.....	7½¢	each
No. 3.....	10¢	each

CROSLEY MAGFON

No Radio station is complete without this MAGFON. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the CROSLEY MAGFON by simply inserting it in the back of the cabinet. Mahogany finished \$10.00.



CROSLEY RADIO PARTS shown on these pages are the personification of economy and efficiency. The fact that they are endorsed and used by the best Radio Men in the country should be sufficient testimonial.



CROSLEY VARIOMETER PARTS

These variometer parts are made in our own large wood working plant on special automatic machinery, which enables to not only offer them to you at a price reduction, but to make each part accurately. Each Variometer set consists of two stators, one rotor and the necessary hardware shown in the illustration.
Made of poplar wood, well shellaced.....\$1.50
Made of Mahogany.....1.75
Winding form extra30

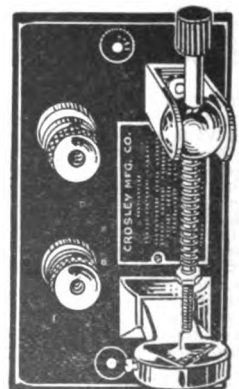
CROSLEY VARIO-COUPLER PARTS

The CROSLEY VARIO-COUP-
LER is made with the same accuracy as the CROSLEY VARIOMETER, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.
Complete as shown in illustration, ready for assembly—\$1.50. Also furnished completely wound and assembled complete with knob and dial "Better—Costs Less"—\$3.00.



CROSLEY CRYSTAL DETECTOR STAND

This unit is especially well constructed, neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystal, binding posts, etc., manufactured under the following patents:
"Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 23, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement.—\$2.50.



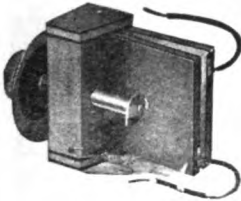
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Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

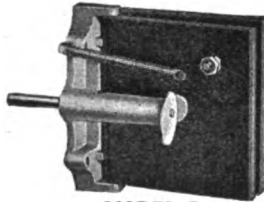
CROSLEY MANUFACTURING CO.
DEPT. QST 2
CINCINNATI, OHIO

CROSLEY RADIO PARTS are manufactured from the best materials money can buy and are the acme of quality. We draw your especial attention to the **CROSLEY** patent **BOOK-TYPE VARIABLE CONDENSER** which impartial tests show to have less resistance than any other condenser on the market.

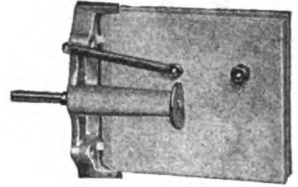
CROSLEY



MODEL A



MODEL B

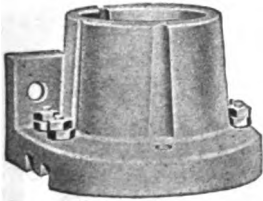


MODEL C

CROSLEY VARIABLE CONDENSERS

The **CROSLEY VARIABLE CONDENSERS** are undoubtedly one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

Model A, .0005 Mfd. (Wood Frame).....	\$1.25
Model B, as illustrated, .0005 Mfd.....	\$1.75
Model C, .001 Mfd. (Porcelain Plates).....	\$2.25

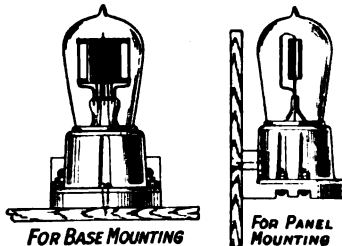


CROSLEY V-T SOCKET

This socket has been pronounced by many radio engineers the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due

to the price, its real popularity is based on its high quality efficiency service and practical unbreakability. Patents Pending. Beware of Imitators.

Made of porcelain for base, or panel mounting—\$0.50.



FOR BASE MOUNTING

FOR PANEL MOUNTING

Patent Applied For

CROSLEY KNOB AND DIAL



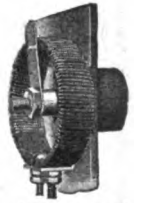
Attractive and inexpensive, **CROSLEY KNOBS** and **DIALS** are extremely well made for all required purposes. The dials are made of solid hard rubber 2 1/2 in. diameter, with the letters and figures stamped into them and white enameled. Furnished Standard for 1/4" shaft or 3/8" shaft, optional—\$0.40.

CROSLEY RHEOSTAT

This rheostat permits exceptionally accurate and delicate variations of the filament current. With it the best possible results are received from expensive vacuum tubes.

Unique construction allows the **CROSLEY RHEOSTAT** to be mounted on a panel of any thickness up to and including 3/8 inch. A special grade of non-corrosive wire forms the resistance and results in highly efficient service.

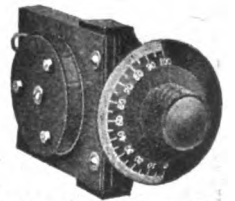
Furnished complete with newly designed tapering knob, pointer, etc.—"Better—Cost Less"—\$0.60.



CROSLEY

R. F. A. T.

The **CROSLEY RADIO FREQUENCY AMPLIFYING TUNER** is a new unit which takes the place of the Radio Frequency Amplifying Transformer and is much better. It makes possible sharp and efficient tuning over a broad band of wave lengths from 200 to 600 meters. The **Crosley R. F. A. T.** solves the radio frequency problem. With Instructions—\$4.00.



CROSLEY TAP SWITCH



The unique construction of **CROSLEY TAP SWITCHES** assures a constant tension and eliminates all possibility of the switch loosening and developing a faulty contact on the taps. A stationary washer of our own design has a soldering lug which makes possible a bus wire connection. All **CROSLEY TAP SWITCHES** are furnished with a newly designed tapered knob and nickel-plated switch arm and bushing.

Price each complete.....30 cents
Switch Taps for the above made of brass, nickel-plated and complete with brass nut, 2 1/2 cents each.

Write for Catalog

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.

DEPT. QST 2 CINCINNATI, OHIO

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS



No muss, trouble, dirt—no moving of batteries—loss of time—no technical or professional knowledge needed. May be used right in your living room.

THE RADIO HOMCHARGER DE LUXE

charges your "A" or "B" battery over night and is the only rectifier on the market combining the following essential HOMCHARGING features:

- 1—Simplicity itself—attach to any lamp socket and connect battery.
- 2—Self-polarizing. Battery may be connected either way and will always charge.
- 3—Fully automatic in operation—gives taper charge—cannot overcharge or injure your battery.
- 4—Safe. All parts entirely enclosed. No danger from fire. APPROVED BY UNDERWRITERS EVERYWHERE.
- 5—Constructed of the best material—genuine Bakelite Panel, Jewell Ammeter, closed Core Silicon Steel Transformer. No castings used, only the best stampings throughout. UNQUALIFIEDLY GUARANTEED.
- 6—No delicate bulbs to break or burn out. Only one moving and two wearing parts, replaceable as a unit, at small cost.

AN ORNAMENT FOR YOUR LIVING ROOM

Beauty has been combined with utility in the NEW RADIO HOMCHARGER DE LUXE. The body is beautifully finished in mahogany and gold. Equipped with rubber feet, it cannot mar polished surfaces. It harmonizes with the finest living room.

Furnished complete. No extras to buy. Price, \$18.50 at all good dealers, or shipped prepaid upon receipt of purchase price.

Booklet illustrating the NEW RADIO HOMCHARGER DE LUXE in actual colors is FREE for the asking. Send for your copy today.

DEALERS—JOBBER: Over 150,000 HOMCHARGERS will be sold this fall and winter. Send for "HOMCHARGER Business Builders" and Discounts and see how you can get your share of this business.

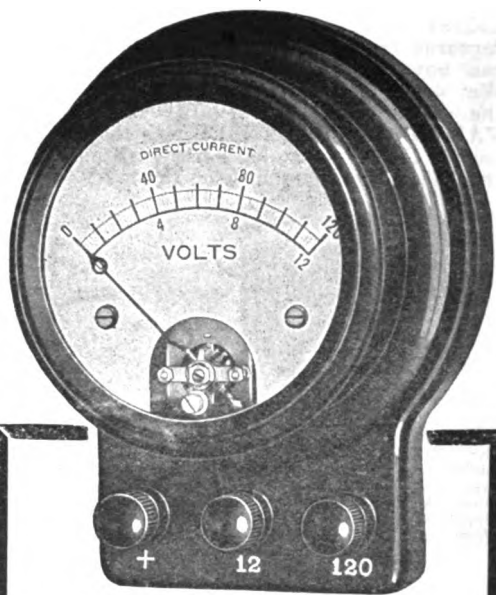
The Automatic Electrical Devices Company

127 West Third St. - CINCINNATI, O.

Largest Manufacturers of Vibrating Rectifiers
in the World



OVER 50,000 IN USE



A-B BATTERY TESTER

The Jewell A-B Battery tester fills a need for a low priced but accurate portable instrument for checking battery voltages. Double readings 0-12-120 volts is the range usually supplied, which takes care of the "A" battery under all conditions and the "B" battery up to the highest commonly used for receiving.

PRICE \$10.00

We were the first to supply a complete line of miniature radio instruments of uniform size. Ask your dealer or write to us for complete radio circular.

Jewell Electrical Instrument Co.
1650 Walnut Street, Chicago



Na-ald De Luxe V. T. Socket

Contact strips of laminated Phosphor bronze press firmly against contact pins, regardless of variation in length. No open current trouble possible.

Socket moulded from genuine Condensite. Practically unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price 75c.

Special proposition to dealers and jobbers.

ALDEN-NAPIER CO.

Dept., M.
52 Willow St. SPRINGFIELD, MASS.

VACUUM TUBES CUNNINGHAM

*Built
To Give Maximum
Efficiency*

VACUUM tubes are used for two distinct individual purposes in a receiving set—as DETECTORS and as AMPLIFIERS. The qualifications of a tube for these two uses are so different that for maximum efficiency tubes of entirely different design must be used.

This point was one of the chief considerations of the research engineers who designed Cunningham tubes in the great laboratories of the General Electric Company. After years of research and experimental work, the Cunningham C-300, a SUPER-SENSITIVE DETECTOR, and the Cunningham C-301, a DISTORTIONLESS AMPLIFIER, were developed. These two tubes, now nationally recognized as standards for all types of receiving sets, are responsible for the highly perfected results obtainable in radio phone reception.

Amplifies As It Detects

TYPE C-300
GAS CONTENT
DETECTOR
\$5.00

TYPE C-301
HIGH VACUUM
AMPLIFIER
\$6 50

PATENT NOTICE

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.



248 First Street
San Francisco, Calif.

E. J. Cunningham

Trading as
AUDIOTRON MFG. COMPANY

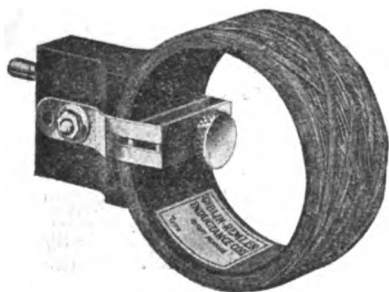


The trade mark GE is the guarantee of these quality tubes. Each tube is carefully inspected and tested before leaving the G. E. factory.

154 West Lake Street
Chicago, Illinois

REMLER

Giblin-Remler Inductance Coils



Ideal For Reception On All Wave Lengths

It is well known among radio engineers that the most efficient receiving sets are those designed so that all of the turns of wire in their inductance coils are in constant use, regardless of the wave length being received. This factor limits the wave length range of the most efficient sets for Radiophone reception.

Maximum Inductance and Minimum Distributed Capacity

Type and Number of Turns, Mounted	Price, Mounted	Type and Number of Turns, Unmounted	Price, Unmounted	Inductance in Milli-henrys, at 1000 cycles, Accuracy 1/2 %	Natural Wave Length in Meters, Accuracy 1/2 %	Distributed Capacity in P.F., Accuracy 1 %	Wave Length in Meters, Reading Condenser of .001 max. and .00004 min. m.h.	High Frequency Rating, Oms at Wave Length Above
							Min. Max. 200 500 1000 2000	
RG 20M 1.50	RG 20U .70	.030	39	14.3	63	334	1.1	
RG 25M 1.50	RG 25U .70	.041	47	18.2	78	389	1.5	
RG 35M 1.50	RG 35U .70	.083	87	25.4	128	550	2.5	
RG 50M 1.60	RG 50U .80	1.00	116	21.6	185	725	3.5	4.4
RG 75M 1.65	RG 75U .85	.377	163	19.8	296	1170	24.3	12.1
RG 100M 1.70	RG 100U .90	.646	217	19.9	358	1550	66.3	26.5
							1000 2000 5000 10000	
RG 150M 1.75	RG 150U .95	1.503	281	14.6	512	2320	69.8	23.5
RG 200M 1.80	RG 200U 1.00	2.28	374	14.7	690	3110	80.8	12.5
RG 250M 1.90	RG 250U 1.10	4.20	424	12.1	860	3580	87.5	19.9
RG 300M 2.00	RG 300U 1.20	6.11	494	11.2	1030	4060	141	29.2
RG 400M 2.10	RG 400U 1.30	11.04	618	9.7	1380	6300		54.6
RG 500M 2.30	RG 500U 1.50	17.50	747	9.0	1730	7900		63.1
							2000 5000 10000 20000	
RG 600M 2.40	RG 600U 1.60	29.2	1024	10.1	2260	10250	111	43.6
RG 750M 2.65	RG 750U 1.85	39.0	1249	11.3	2880	11850		64
RG 1000M 3.40	RG 1000U 2.50	71.8	1620	10.3	3570	18000		123
RG 1250M 3.80	RG 1250U 2.90	106.0	1930	9.7	4380	19700		
RG 1500M 4.40	RG 1500U 3.50	159.5	2300	9.3	5300	23600		

This table compiled by Robert F. Field of Craft High Tension Electrical Laboratory, Harvard University, Cambridge, Mass.

Maximum efficiency is obtained for any given range of wave lengths in either single circuit or coupled circuit receivers by using Giblin-Remler Coils, shunted by variable condensers. Any desired range of wave lengths is at the operator's disposal by merely changing the size of the coils used in the coil mounting.

This operation does not require the connecting of any wires and is as simple and quick as inserting a telephone plug in a jack. If variable condensers of .001 micro-farads capacity are used, four sets of Giblin-Remler Coils (of sizes determined from the table) will cover the entire range of wave lengths between 128 and 23,800 meters.

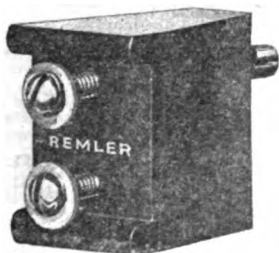
Send 10c for new 40 page Remler Catalogue just off the press containing circuit diagrams for Remler Apparatus and other useful information including a table of inductance, capacity and wave length.

REMLER RADIO MANUFACTURING COMPANY

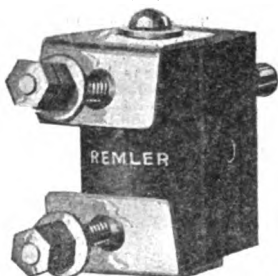
248 First Street, San Francisco, Cal.

154 W. Lake Street, Chicago, Ill.

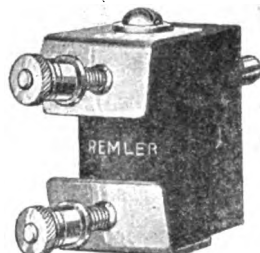
REMLER



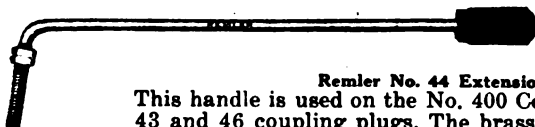
**Remler No. 42 Bakelite
Panel Plug**
Price 60c



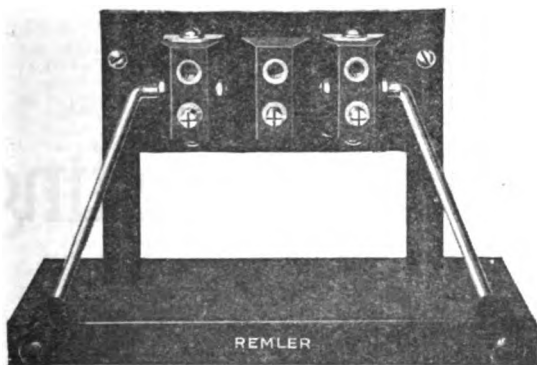
**Remler No. 43 Bakelite
Coupling Plug**
Price 90c



**Remler No. 46 Bakelite
Coupling Plug**
Price \$1.00



Remler No. 44 Extension Handle
This handle is used on the No. 400 Coil Mounting and fits No. 43 and 46 coupling plugs. The brass rod is nickel plated and fitted with moulded insulating handle. Two hexagon nuts provided for locking on plug. Length 5 1/4".
Price 30c



Remler No. 400 3 Coil Mounting
The Remler No. 400 3 Coil Mounting is specially designed for the Giblin-Remler Inductance Coils, but is equipped with standard coil plugs and permits the use of any standard inductance coil. Bakelite Panel and Base.
Price \$7.50

Send 10c for new 40-page Remler Catalogue just off press, containing circuit diagrams for Remler Apparatus and other useful information, including a table of inductance, capacity and wave length.

Specify Remler-- It Radiates Quality

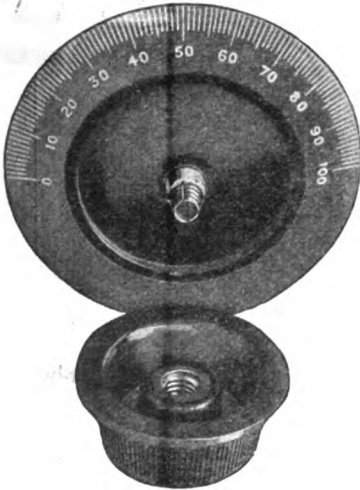
The Remler All BAKELITE 3 coil mounting is undoubtedly the most efficient coil mounting on the market. The special shape of the Plugs allows a coupling range from zero to 90 degrees. The use of the long, insulated handles for adjusting coupling keeps the operator's hands away from the coils and minimizes body capacity effects.

For those who desire to build their own sets Remler high quality BAKELITE panel and coupling plugs and Extension Handles are sold unmounted as listed above.

REMLER RADIO MFG. COMPANY

248 First Street, San Francisco, Cal.

154 W. Lake Street, Chicago, Ill.



Patented June 20, 1922.

The Only Knob and Dial Without a Set-screw

The unsightly and troublesome SET-SCREW is at last eliminated. No more splitting the head of the set-screw or stripping of threads, perhaps ruining the dial.

To mount the TAIT-KNOB-AND-DIAL simply hold the dial with one hand and screw on the knob with the other; a few seconds does it. No tools are necessary. When fastened it is self centering and self aligning.

This beautiful patterned KNOB-AND-DIAL is made of the best grade of BAKELITE.

To those building their own sets—Don't fail to use this dial, it is REVOLUTIONARY in its field and is the PEEF of all KNOBS-AND-DIALS. If your dealer has none write

us, and we will refer you to one who has.

Dealers—If your Jobber is not stocked up write us and we will refer you likewise.

Price—4"\$1.50
Price—3"\$1.00

*We Sell Strictly to Manufacturers
and Jobbers—whom we invite to
write us for samples and discounts.*

TAIT KNOB & DIAL COMPANY

Incorporated

11 East 42nd Street. Dept. Q. New York

Phone Murray Hill 0341

**Used and Recommended by
the Largest Radio Concerns**



BUY IT IN CARTONS



TRANSFORMER ENGINEERS SINCE 1911

ARE MANUFACTURERS

of

TRANSFORMERS

INDUCTANCES

& CHOKE COILS

for

RADIO

72½ Francis Ave., Hartford, Conn.



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**Audio Frequency
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This part used as an intervalve unit in a cascade amplifying outfit, utilizes to the highest degree amplifying properties of all makes of vacuum tubes. Maximum amplification within the tube limits is made possible and distortion of the signal is eliminated. The ratio is nine to one.

Highest degree of insulation of the primary and secondary windings is assured by the vacuum impregnating process in manufacture.

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Cord—Six foot.
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Socket**

The contact points or fingers are supported by a single piece, tempered steel spring of proper tension. The four terminals are insulated from this spring by Bakelite insulation.

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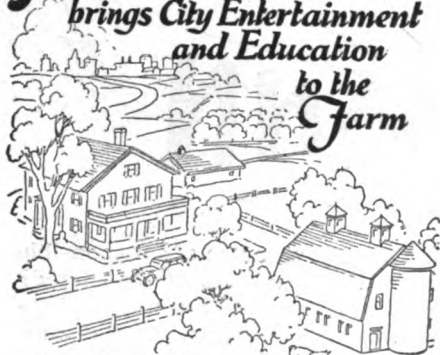
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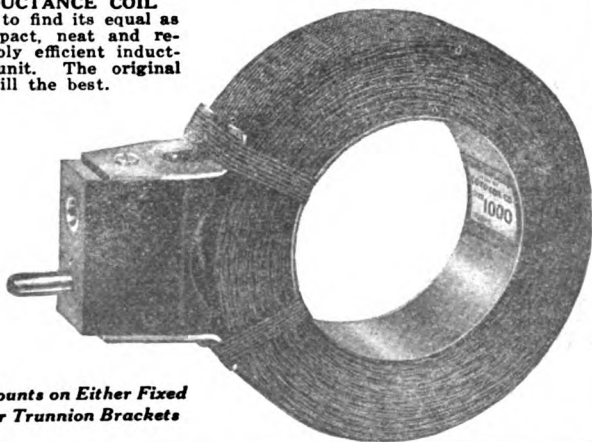
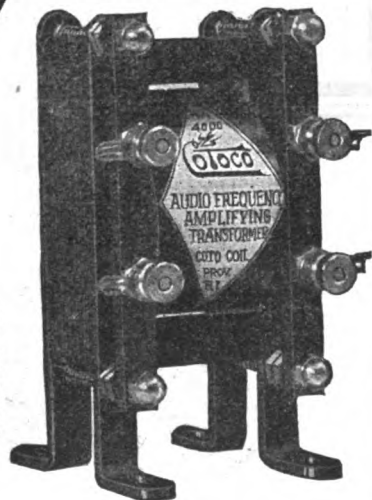
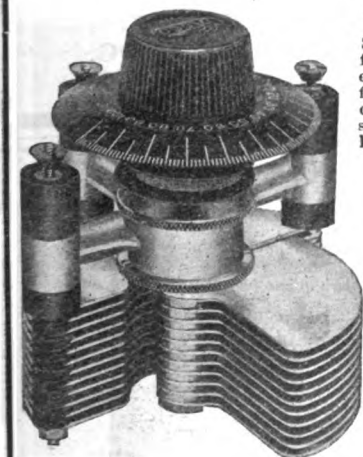
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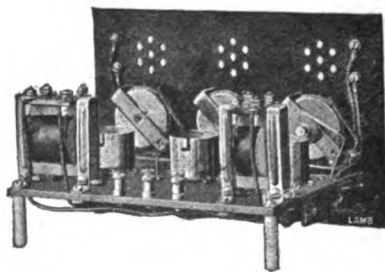
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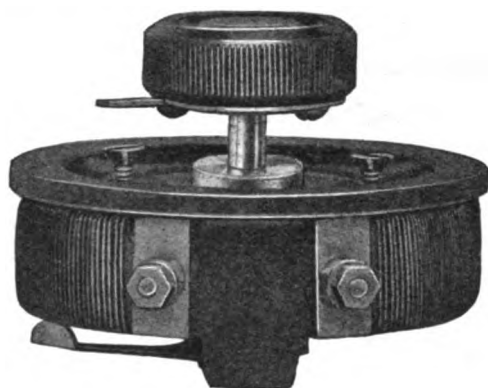
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The General Radio Company Type 214-A, 400-ohm potentiometer was constructed for just this service. Many of the original experiments on radio frequency amplification and super-regeneration were conducted using this very potentiometer.

Can you get at critical points on the curve of your detector tube? You can if you use one of these potentiometers in your plate circuit.

The construction of these potentiometers is similar to that of our Type 214 rheostats that have met with your approval for many years. They are all made in two styles of mounting, 214B for front-of-panel, and 214A for back-of-panel. Ask to see them at your local dealers.

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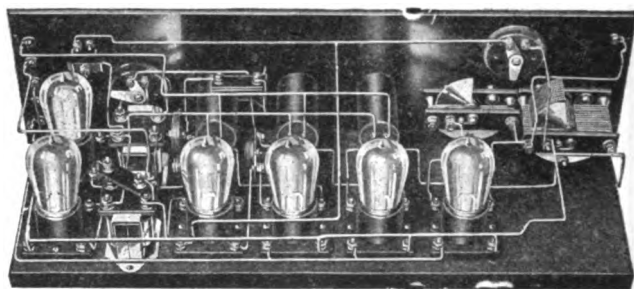
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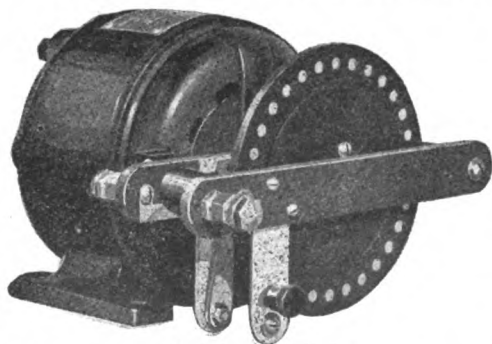


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With a Tungar Battery Charger you can easily keep your batteries up to full voltage. It enables you to recharge batteries from any a-c. lighting circuit at your convenience and at a minimum cost. The battery doesn't have to be taken out of the house. "B" storage batteries, also, can be charged by means of a simple, inexpensive attachment.

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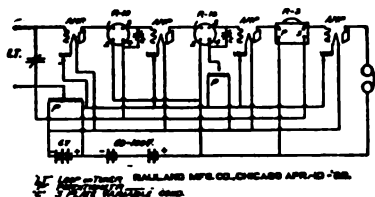
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Radio and Audio frequency are day by day becoming more and more important. The days of sets with detector only, are gone.

To get the best results you must use the best transformers. "All-American" Radio and Audio Frequency Transformers



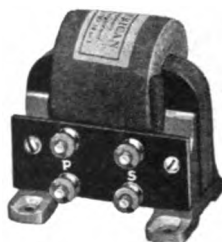
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Type R. 10.....\$4.50



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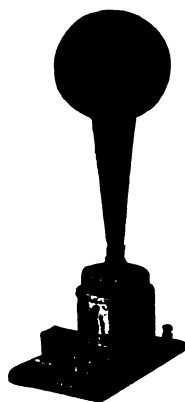
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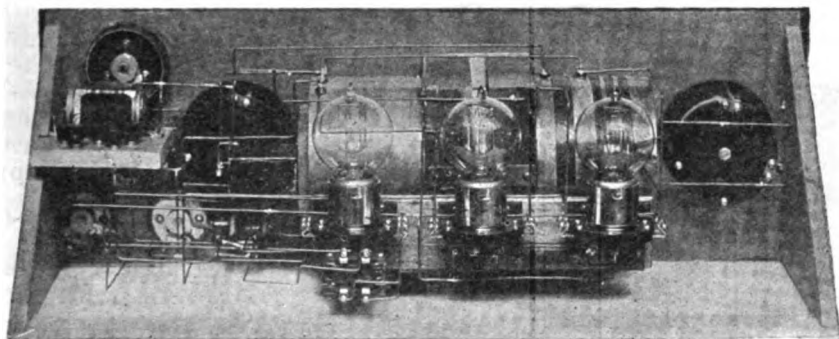
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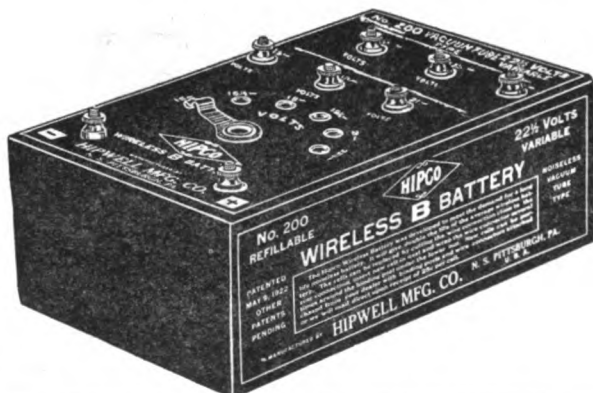
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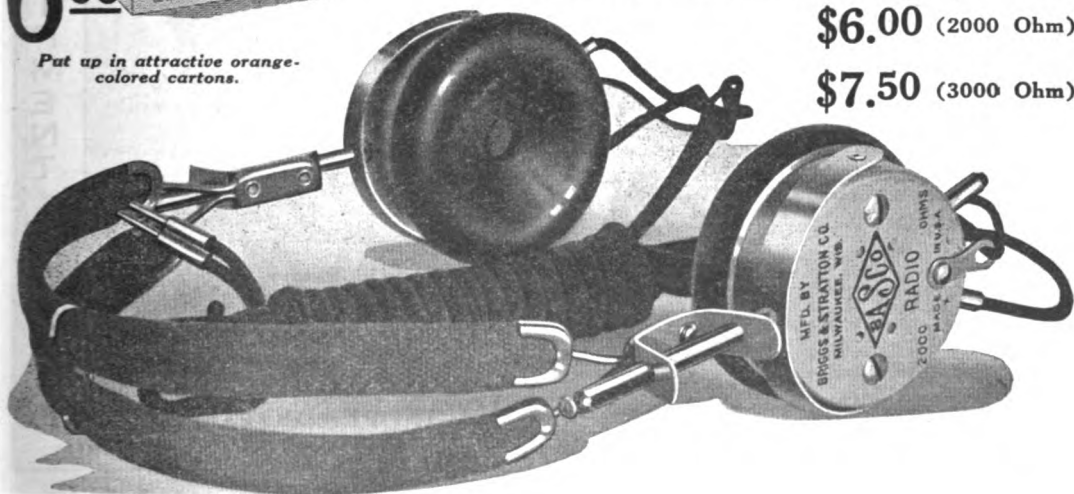


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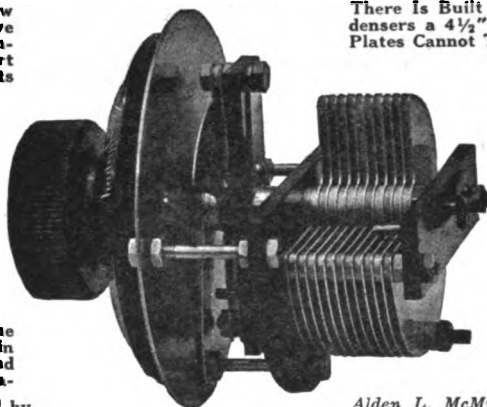
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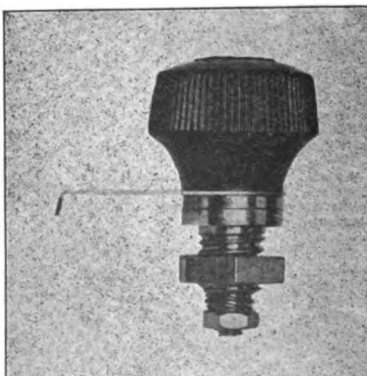
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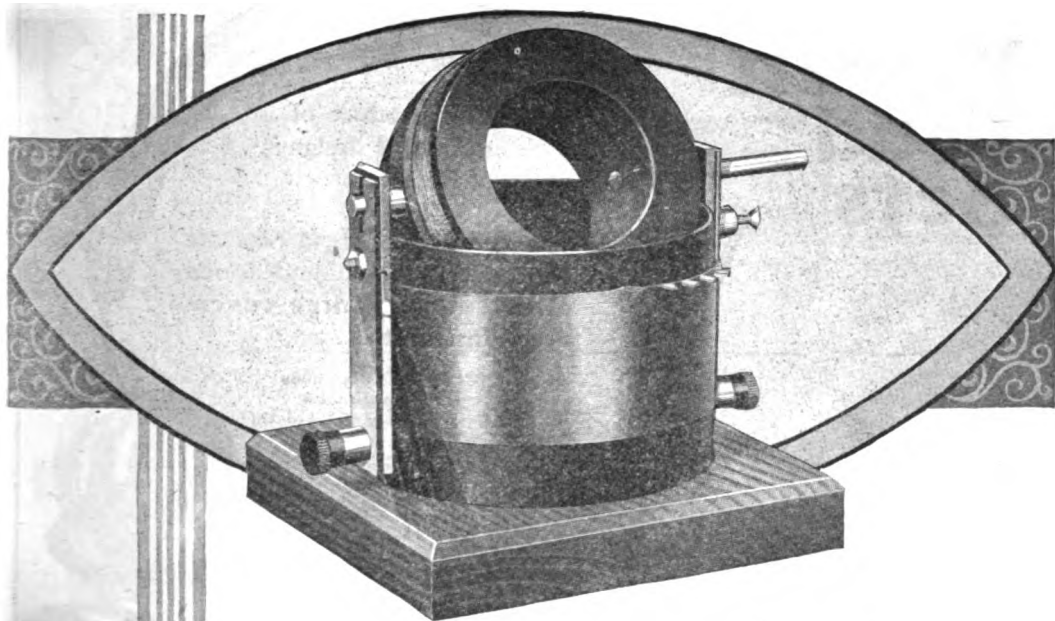
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No. 410 Rotary Switch Lever:
Double brass Lever, heavily nickel plated. 1½ in. Radius. Can't work loose. Absolutely the **BEST** on the market today. Fully Guaranteed. Money back if not satisfied.

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The Thoroughbred Vario-Coupler

An essential to every worth while radio set

IT IS an interesting thing to observe that A. Frederick Collins, Inventor of the wireless telephone, in "The Radio Amateur's Handbook" (Thomas Y. Crowell Co., New York) places the vario-coupler first in the list of parts essential to a successful regenerative receiving set. This only serves to emphasize the importance of a proper vario-coupler as essential to every set.

The Thoroughbred Vario-Coupler because of its exclusive features is chosen by experienced amateurs to complete their sets. The Thoroughbred Vario-Coupler is of the all-moulded type which reduces losses and is not subject to dampness. The first seven taps on the primary are tapped one turn at a time and the last seven, a tap at each seven turns. The user is thus able to **TUNE IN ONE TURN AT A TIME**—a feature not found on any other vario-coupler.

The amateur can use it with base on a table or he can mount it on a panel merely by removing this base.

The secondary of the Thoroughbred Vario-Coupler is wound with fine wire in order that it may be used for plate and tickler, thus doing away with the need for a variometer. On the average aerial it has a wave length of 200 to 700 meters. You can buy it at good radio and electrical stores for \$5.00.

The Thoroughbred Vario-Coupler is but one of fifteen radio products manufactured by the Marshall-Gerken Company in their new and larger plant at Toledo, Ohio.

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Warren Head Sets



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35c. Each

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Na-ald Genuine Condensite Dial

The dial that runs true.

Numerals engraved on bevel
and knob so shaped that fingers
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HOWARD VERNIER RHEOSTATS

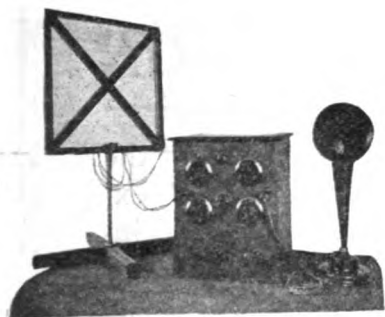
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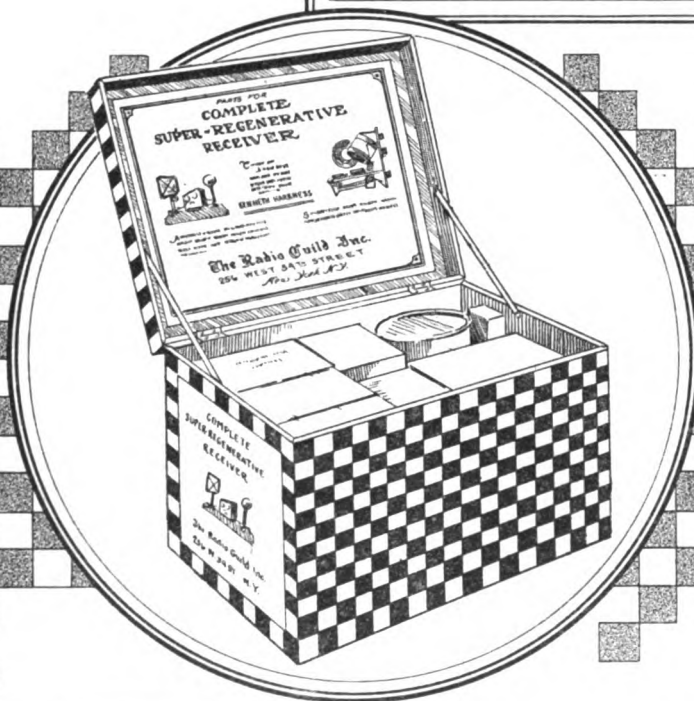


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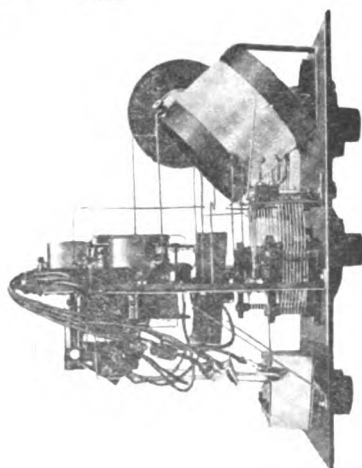
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We have a complete stock of the old line Radio Companies' experimental and measuring instruments and parts.

The famous Grebe Receivers and Amplifiers are our specialty.

We are the official Radio Corporation Distributors.

Have your dealer order from us.

PHILADELPHIA WIRELESS SALES CORPORATION

Formerly Philadelphia School of Wireless Telegraphy

1533 PINE STREET

PHILADELPHIA, PA.

AUDIO FREQUENCY AMPLIFIER



MOUNTED TYPE M

Silicon Steel Cores; Shell Design—Bakelite Terminal Board; Ratio—9 to 1; Insulation test 1500 Volts.

Mounted Type M—\$5.00

Semi Mounted Type SM—\$4.50

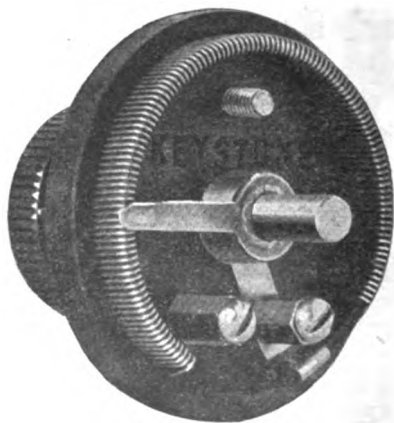
Unmounted Type UM—\$4.00

Discount 10% for cash with order

Designed by *Packard* Engineers—

a quality name in Radio.
THE STANDARD TRANSFORMER CO.
Warren, Ohio

KEYSTONE FILAMENT RHEOSTAT



Resistance 6 Ohms.

Carrying Cap. 1 1/4 Amps.

Base, moulded Bakelite.

2 1/4 In. Diameter.

All metal parts, made of brass, and nickel plated.

Large Knob, with polished pointer.

List Price \$1.00

Manufactured By

Keystone Radio Company
Dept. Q, Greenville, Penn.



Eveready "A" Batteries

- hardwood box, mahogany finish
- convenient handle, nickel plated
- rubber feet protect the table
- insulated top prevents short circuits
- packed vent caps prevent spilling

No. 6860—90 Amp. Hrs.—45 Lbs.—\$18.00

No. 6880—110 Amp. Hrs.—52 Lbs.—\$20.00



Eveready "B" Battery No. 766

Equipped with 5 positive voltage taps ranging from 16½ to 22½ volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price \$3.00



Eveready "B" Battery No. 774

Equipped with 6 positive voltage taps at 4½ volt intervals ranging from 18 to 43 volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price \$5.00



For Better Results
USE

EVEREADY

"A" and "B" BATTERIES
with your radio set

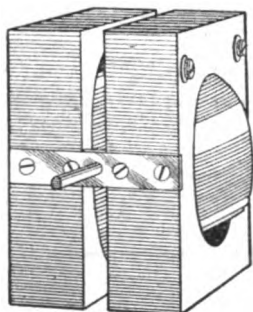
For sale by the better radio
supply dealers everywhere

Send today for descriptive booklets

NATIONAL CARBON COMPANY, Inc.
Long Island City, N. Y.

Atlanta Chicago Cleveland
Kansas City San Francisco

Make Your Own Receiving Set



NATIONAL VARIOMETER
Complete Postpaid \$4.00

With These Parts
The National variometer and variocoupler are specially designed for the reception of wavelengths between 150 and 650 meters. Two of the variometers and the variocoupler make a regenerative receiver that will bring in loud, clear and properly tuned signals. Make your own set and save 40 to 50%

VARIOMETER

Beautifully finished, substantially built and absolutely accurate in every detail. Minimum clearance between Rotor and Stator insures highest degree of efficiency. Especially adapted for the reception of concerts, lectures and other forms of broadcasting.

\$4.00

Each, postpaid.....

VARIO-COUPLER

This 180° coupler permits the sharp tuning necessary to get distant stations. Wound especially to get the best results on amateur wavelength broadcasting. Positive contacts throughout. Neat in appearance, efficient in operation. Each, postpaid..... **\$3.50**

VARIOMETER PARTS—At Factory Prices

For the amateur who wants to wind his own variometer, we furnish the wooden parts and all necessary wire, screws, hardware, etc.

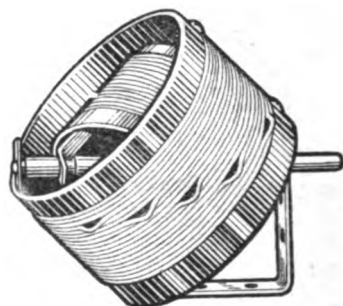
Wood Rotors—4" diameter, 2" wide, 90c
grooved for windings, postpaid, each
Wood Stators—4 1/4" square, with slots for
bearing plates, postpaid, \$1.00
per pair.....

Wire, etc.—complete set of all wire, screws and hardware needed to wind and assemble the complete variometer as shown in illustration above, postpaid, per set..... **70c**

DEALERS, JOBBERS: ATTENTION

We manufacture these variometers and variocouplers in our own factory and have good stock ready for immediate shipment. Write for our very attractive prices.

NATIONAL RADIO CO., INC., 1302 S. VAN DEVENTER,
ST. LOUIS, MISSOURI



NATIONAL VARIOCOUPLER
Complete Postpaid \$3.50

WIS-WIN SWITCHES

We build switches de luxe at a price within reason. Special phosphor-bronze spring washer concealed in the bushing, with tension properly adjusted at the factory, insures firm contact at all times. No WIS-WIN switch need be taken apart to mount. Each switch adjusted, and enclosed in box with template for drilling holes for switch points.

Dealers: We can make prompt deliveries now, and have an attractive proposition.

Manufacturers: We are equipped to build switches according to your requirements. Improve the quality of your sets by using WIS-WIN switches.



No. 750 1 1/2" radius
No. 752 1" radius
Price 55 Cents Each
Willis Switch & Instrument Co.

8 Kingsbury St.

Circular S-1, describing our line: V-blade, Series-parallel, concealed B-Battery, Inductance, etc., sent free upon request.

If you cannot obtain Wis-Win switches from your dealer we will ship postpaid on receipt of money order.

JAMESTOWN, N. Y.

JOBBERS AND DEALERS BIG MONEY IN RTS Radio Equipment

The demand for RTS Equipment has become so great that for two or three months we have been behind on orders. But now, with our greatly enlarged plant, we are able to supply standard and special equipment to dealers and jobbers in any quantity.

We show here one article that has proven exceedingly popular:

RTS CONDENSERS



The RTS Condensers shown above are standard in type and among the leaders in the industry. They eliminate howling, clear up phone speech and make the tubes perform perfectly. Furnished with mountings complete, ready for connections. Every condenser is thoroughly tested. They are made in three capacities.

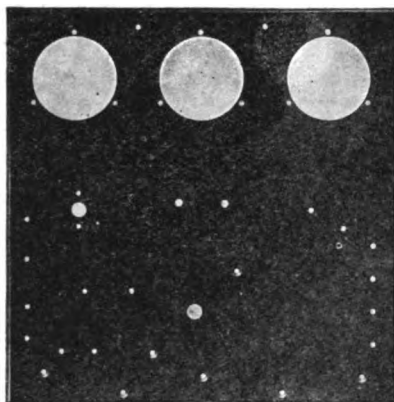
Grid Condenser .0005 M. F. Retail at.....30c
Grid Condenser and Leak, combined Retail at.....45c
Phone Condenser .0013 M. F. Retail at.....30c

JOBBERS AND DEALERS OPPORTUNITY

Now is the time to cash in big profits! Amateurs in all parts of the country are demanding RTS equipment and Specialties. Write today for price lists and liberal discounts to the trade.

RADIO TESTING STATION

Dept. Q-10 25 Sturgis Street
Binghamton, New York



CONDENSITE CELORON

Sets a New Standard in Radio Panels and Parts

This strong, handsome, jet-black, insulating material gives you a surface and volume resistivity greater than you will ever need, and a beauty that will make your set the envy of your friends. It is the ideal material for making radio panels because it is highly dielectric, machines readily, engraves with clean cut characters and can be finished with a high, natural polish or a rich, dull, mat surface.

If you want the highest type panel you can obtain—a panel made from a material approved by the Navy Department Bureau of Engineering—a panel that will give you continued satisfactory service—insist upon a Condensite Celoron Panel.

Make Your Next Panel of Condensite Celoron

If your local radio dealer cannot supply you with a genuine Condensite Celoron Panel get in touch with us direct. We'll see that you are supplied.

An Opportunity for Radio Dealers

Condensite Celoron Radio Panels offer a sales opportunity unequalled to the live wire dealer who is keen on building business on a quality basis. Write us today for our special Dealers Proposition and let us give you all of the facts.

Diamond State Fibre Company
Bridgeport (near Philadelphia), Pa.

Branch Factory and Warehouse, Chicago
Offices in principal Cities.

In Canada: Diamond State Fibre Co., of Canada, Ltd., Toronto.

Order NOW For Fall

DISTRIBUTORS FOR Radio Corp. of Amer. Westinghouse General Electric

Frost	Kellogg
Remler	Acme
Fada	Homecharger
Murdock	Signal
General Radio	Pacent
Brandes	Rham-tine
Baldwin	Connecticut
Burgess	Arkay
Hipco	Radio Service
Chel-ea	Tuska
Holtzer-Cahot	
Clapp-Eatsman	
and other	
leading manufacturers	

When vacation time is over and the days get shorter, Radio is going to take its place again in filling up the long, chilly evenings both in the city and on the farm. There will be big demands for both parts and complete sets. Will your stocks be up-to-date and able to take care of all this trade?

Now is the time to put your stock in order for Fall, not at the last moment, when we are rushed with orders and deliveries may not be so prompt. Order Now. Today. Our new, illustrated Catalog No. 200T will help you. Send for it.

WHOLESALE ONLY



LUDWIG HOMMEL & CO

530-534 FERNANDO ST.  PITTSBURGH, PENNA

McTIGHE ALKALINE STORAGE "B" BATTERY for RADIO OUTFITS



The McTighe Storage "B" Battery is the most satisfactory for radio use. It gives 22 volts, is in expensive-noiseless--cannot be damaged by short circuit, overcharging, standing idle or uncharged. Can be fully charged from any light socket for less than one cent. Is furnished in an oblong glass case which nests neatly. The McTighe Rectifier is cheap, simple, durable, and effective, and should be used when charging the McTighe "B" Battery.

Battery \$5.00, Rectifier \$1.50, Rubber Filler 25¢
F. O. B. Irwin, Pa.

Discount to Dealers Address Dept Q Prompt shipments

ECONOMIC APPLIANCE CO.
IRWIN, PENNA.

Agent for the



COLUMBIA RADIO
SUPPLY CO.
808 19th St. N. W.
Washington, D. C.

DX RADIO FREQUENCY TRANSFORMER

Be up to date, use R.F. Amplification and coil aerial. The secret of long distance reception. We know it is superior, prove it for yourself. Free folder on principles of radio frequency amplification with pictorial diagram.

DX 1—170-450 meters \$8
DX S—400-1200 meters \$8
DX 2—900-3000 meters \$8
Plug-in socket mounting \$1

Dealers Write



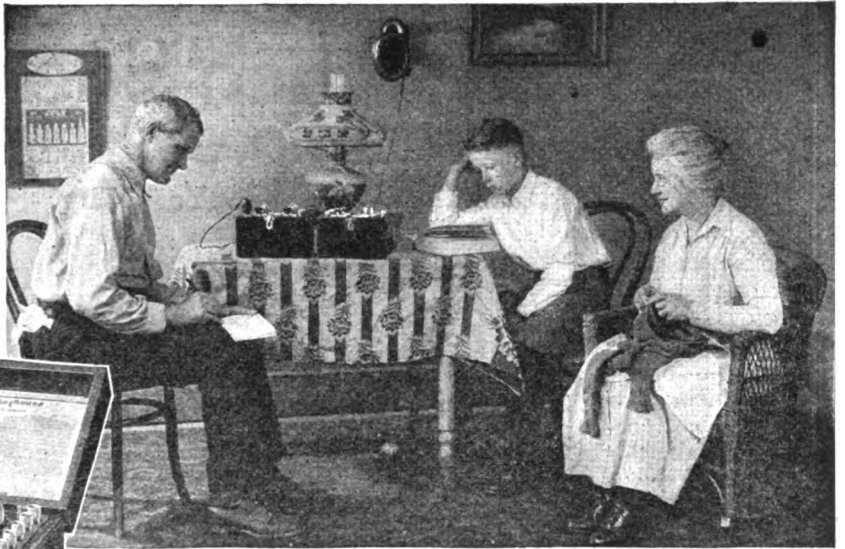
American Electric
HIGH EFFICIENCY
TELEPHONES

"Army and Navy" and
Swedish-American Types

American Electric
COMPANY

CHICAGO, U. S. A.

For 30 Years Makers of Good Telephones



AERIOLA AMPLIFIER

*Model AC, complete with
2 WD11-A vacuum tubes
(without batteries) \$68.00*

*Vocarola Loud-Speaker
Model LV.....\$30.00*



*This symbol of quality
is your protection.*

*Before buying radio ap-
paratus, always consult
the book "Radio Enters
the Home." Price 35 cents
by mail.*

The A. C. AMPLIFIER for the AERIOLA SR.

The Aeriola Sr., simplest and most efficient of all single-tube receiving sets, becomes still more efficient with the new model A C amplifier.

No storage battery is required. With only two dry cells, two tubes, and a 45-volt plate battery the model A C amplifier greatly increases the Aeriola Sr.'s range of reception. Used with the Vocarola loud-speaker, the amplifier connected with an Aeriola, Sr., fills a whole room with concerts received over distances of ten to thirty miles.

Anybody can make the simple connections required, including mother and the girls.

Because there are no storage batteries to charge, because both the Aeriola Sr. and this new model A C amplifier are so light and handy the combination is ideal for Boy Scouts and for campers.



Sales Department, Suite 2068
233 Broadway,
New York City

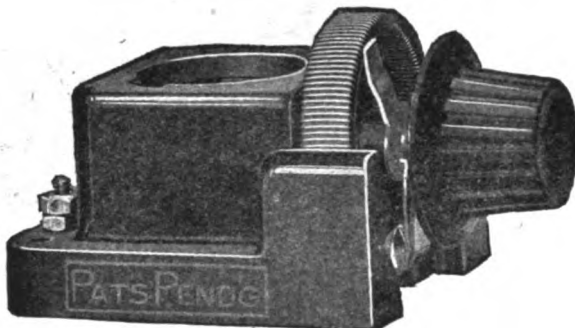
District Office
10 South LaSalle Street
Chicago, Ill.

KING Rheo-Socket

Another RADIO SURPRISE

Price \$3, f. o. b. New York City

Compact, increased efficiency, shorter connections, less wiring — brings in stations you never heard before. Make this a part of your up-to-date set.



A high grade article in Red Bakelite with Phosphor-Bronze Contacts and Alloy Resistance Wire.

For Base or Panel Mounting

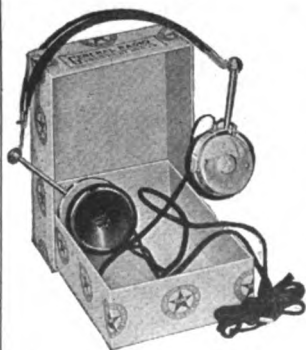
KING AM-PLI-TONE

82 CHURCH STREET

NEW YORK

Mfrs. of the Famous KING AM-PLI-TONE

Jobbers, wire or write for proposition



Red Star Head Phones

Why take a chance with your receiving set by using poor head phones, for after all your radio receiving set is no better than your head phones.

Red Star head phones speak up sharp and clear. Light in weight, they fit the head comfortably and do not tire; they are easily adjusted over the ears.

Protect your receiving set, by buying good head phones—ask your dealer to show you Red Star phones. You will be surprised at the results you will attain.

Monocoil 2000 ohm—\$5.00

Long-distance 3200 Ohm—\$8.00

Including head band and 6 ft. cord.

General Radio Equipment Co.

1133 Diversey Pkway., Chicago



Leadership Established !

During the last two years, this school has set up new New England records for

- (a) Number of graduates
- (b) Average of marks
- (c) Average length of time required.

In qualifying for a First Class Commercial Operators' license.

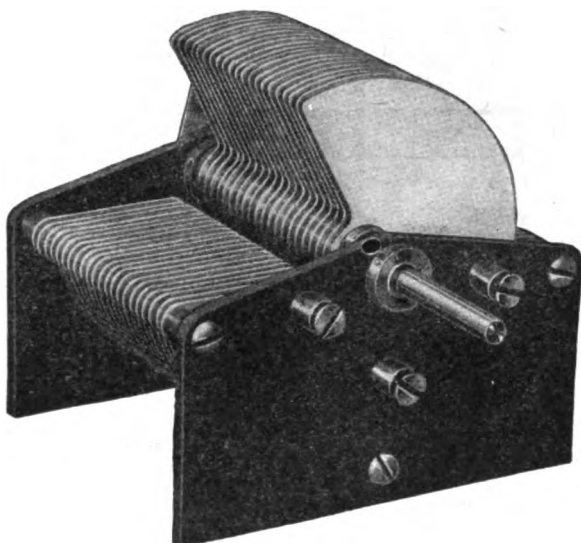
This clearly established leadership in New England places our school among the foremost in the country.

Send for our New Catalog Free

**MASSACHUSETTS RADIO and
TELEGRAPH SCHOOL, Inc.**
18 Boylston St. Boston, Mass.

Formerly Boston School of Telegraphy. Est. 1903

Wimco Announces



THE WIMCO VARIABLE CONDENSER

After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

The WIMCO Variable Condenser is now in production and your orders will have our best attention.

We have a very attractive proposition for the Jobber, and solicit your inquiries. Write for complete price list and discount sheet.

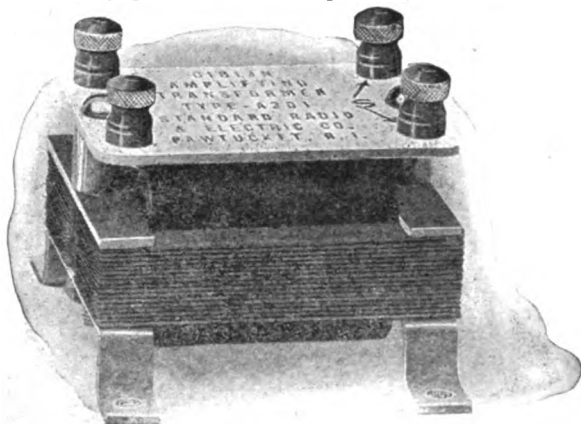
THE WIRELESS MANUFACTURING CO.
CANTON, OHIO

Manufacturers — Distributors

GIBLIN Audio Frequency Amplifying Transformer

Designed for use with standard amplifying tubes.
Maximum amplification without noise and distortion.
May be placed in any position without pre-magnetic coupling or squealing.

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Mounted Type A 201

LIST PRICE

Mounted \$4.50

Unmounted \$3.50

Liberal Discounts Allowed

Also Giblin "Radioear" Vacuum Tube Receiver with one tuning control knob and two stages of amplification. List Price, \$50.00.

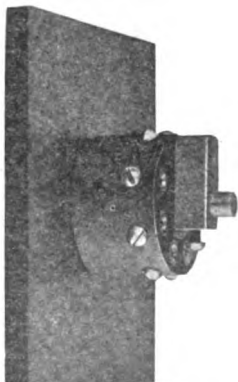
Giblin "Radioear" Crystal Receiving Set. List Price \$20.00.

STANDARD RADIO AND ELECTRIC COMPANY

Pawtucket, R. I.

BACK MOUNTED INDUCTANCE SWITCH

Use
The
Best



Forget
The
Rest

Pat. Appl'd For

In our new Back Mounted Inductance Switch we have the very latest and improved switch. Body is made of Fibre, with Bakelite Knob, and all other parts Brass. It insures perfect connection and eliminates short circuiting. Saves Labor and Time in putting set together. Saves drilling of numerous holes and does away with switch points and lever on front of panel. It is one compact unit all ready to put on panel.

LIST PRICE \$1.25, PARCEL POST PREPAID

Send Circular for this and Other

"RACCO PRODUCTIONS"

RADIO CONSTRUCTION CO.

42 Maverick Square, East Boston, Mass.

1898—1923 25 Years Experience In Head Phone Equipment YOUR GUARANTEE



You will be delighted at the clear, distinct, ring of the message received over the Leich Radio head phones. This company began making head sets in 1898—thus the refinements and improvements of years of actual service tests are incorporated into the Leich head phones.

The head band is light—both ear phones fit evenly and firmly, and can be worn for hours without discomfort—the band can be adjusted by the thumb nut, and remains fixed—no readjustment necessary.

No. 1-D-1500 ohms.....\$7.00

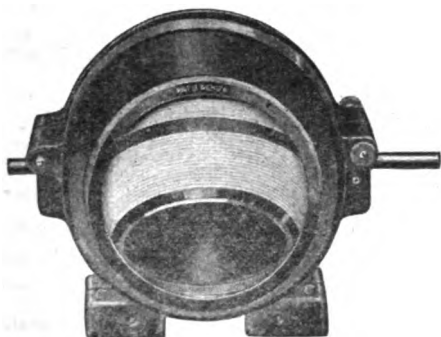
No. 1-B-2000 ohms..... 7.50

No. 1-C-3000 ohms.....10.00

Complete with head band and 6 ft. cord.
Ask your dealer—if he cannot supply write us.

LEICH ELECTRIC COMPANY
GENOA, ILLINOIS

AT LAST QUALITY at the RIGHT PRICE



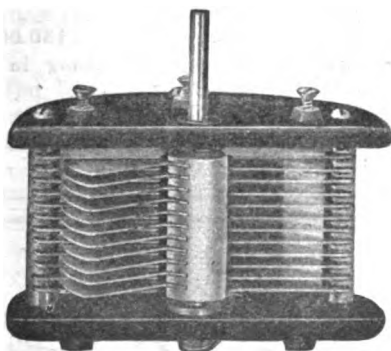
R.P.C. Condensite molded Variometer. Wave length 150 to 500 meters. Heavy Brass Bearings $\frac{1}{4}$ " Shaft. Not Only Electrically Perfect But Mechanically Right.

Variometer Price - - \$6.00

Vario Coupler - - \$6.50

Something different in Dials. Has large tapering knob which will not cramp the hands. Heavy brass insert bearing insuring perfect fit and alignment. Semi-circle slot for stop pins. Large clear lettering. Easily read. Made for $\frac{3}{16}$ " and $\frac{1}{4}$ " shafts. State size when ordering.

Price - - \$1.00



The method of casting both the Rotary and Stationary Plates as solid units, guarantees perfect contact at all times, insuring accuracy in assembly and capacity. Made with specially heavy plates. Pivoted on friction spring which makes a smooth movement with minimum resistance while exerting a counter balancing effect on rotary plates. Special pillars allow either table or panel mounting. We draw your attention to the extremely low price of this particular class of Condenser.

23 Plate .0005 M.F.D. - Price \$3.00

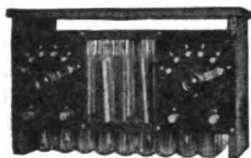
If your dealer cannot supply you we will ship you postpaid on your order with remittance.

Catalogue on Request.

Special Dealers Proposition.

RADIO PRODUCTS COMPANY

WESTPORT, CONNECTICUT



Storage Batteries

designed for

RADIO



KICO "B" BATTERY

KICO "A" BATTERY

FACTS ABOUT KICO STORAGE "B" BATTERIES—

1. Alkaline type.
2. They eliminate noises caused from "Bs" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries sold with the privilege of receiving your money back if unsatisfied within a 90 day trial.
7. Neat, Efficient and Compact.
8. Unlimited life.

	Plain	With Panels
16 cell 22 volts	\$6.50	
24 cell 32 volts	8.00	\$12.00
36 cell 48 volts	10.00	14.00
50 cell 68 volts	12.00	17.00
78 cell 100 volts	16.00	21.00
106 cell 145 volts	21.00	26.00

Literature gladly furnished.

KIMLEY ELECTRIC CO., 1355 Fillmore Ave., BUFFALO, N. Y.

Try REYNOLDS RADIO Service from DENVER

9ZAF

KLZ

Clapp-Eastham H R Receiver . . . \$40.00
Kennedy Type 281 Receiver . . . 80.00
Kennedy Type 220 Receiver . . . 125.00
Kennedy Type 110 Receiver . . . 250.00

Grebe CR5 Receiver . . . \$80.00
Grebe CR8 Receiver . . . 80.00
Grebe CR9 Receiver . . . 130.00

Accessories, Supplies—Everything in
Radio

Send 15c for our new RADIO GUIDE—Refunded on first order amounting to \$5.

REYNOLDS RADIO CO. INC.

1534 Glenarm St., DENVER, Colo.

LARGEST DISTRIBUTORS OF RADIO APPARATUS IN THE WEST

"SHRAMCO PRODUCTS"

Amateurs: Send 5c in stamps today for our new Catalogue L showing complete line of parts, raw materials and high grade apparatus.

Dealers: Write for our attractive proposition.

The Shotton Radio Mfg. Co.,
INCORPORATED

8 Market St.,

Albany, N. Y.



SOUTHERN RADIO CORPORATION

Radio Engineers and Jobbers

905 Realty Building,

Charlotte, N. C.

At Last! *The* Perfect Radio Loud Speaker *for the Home*

THERE is no other Loud Speaker like the DICTOGRAPH—made expressly for home use by the makers of world-famous Dictograph products—standard everywhere for the finest, most accurate and most sensitive sound-transmission and loud-speaking devices. No other organization in existence has the facilities, the skill, the experience of the Dictograph Products Corporation for producing a perfect Loud Speaker.

DICTOGRAPH Radio LOUD SPEAKER

Years of experience in producing the marvelously sensitive "Acousticon" for the Deaf, the Detective Dictograph and the Dictograph System of Loud-Speaking Telephones have made possible this wonderful Radio Loud Speaker that reproduces every sound—singing, speaking, instrumental music—in crystal-clear, natural tones, full volume, and FREE FROM DISTORTION AND NOISE.

The Dictograph Radio Loud Speaker gives perfect results with any vacuum tube receiving set. No alterations; no extra batteries—you simply plug in and listen. The handsome appearance of this quality instrument harmonizes with any home.

Ask for a FREE DEMONSTRATION of the Dictograph Radio Loud Speaker at any reliable radio shop. Get DICTOGRAPH quality and still save money.



List Price
\$20

Complete with 5 ft. flexible cord.

A beautiful instrument! Finely constructed, richly finished. Its handsome appearance harmonizes with any home. Highly burnished, French lacquered, eleven inch spun copper bell horn attached to die cast black enamel tone arm, finished with nickel trimmings. Cabinet 6x5 inches base, 4 inches high, of solid, ebony-finished hardwood, mounted upon rubber knobs. Furnished complete with 5 ft. flexible cord. No extra batteries required.



DICTOGRAPH Radio HEAD SET

The Best Head Set at any Price

The Dictograph Radio Head Set has established a standard of quality impossible to secure in any other head set. Its use on any receiving set, crystal detector or vacuum tube, improves reception immeasurably.

3000 ohms resistance. Price \$12.—the best Head Set in the world at any price. Regularly furnished as Standard Equipment with the Leading Receiving Sets made.

Dealers: Order through your jobber or write for names of authorized distributors.

Dictograph Products Corporation

220 West 42d Street,

Branches in all principal cities

New York City

SOUTHWESTERN AMATEURS

We are about to pass out of the long hot summer and hit the pace once again for a real winter of hi-pressure wireless activity. We wonder if you have ever stopped to think of the service that might be rendered you by this store.

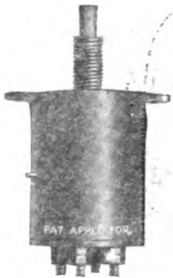
We are thoroughly capable, being the oldest exclusive radio store in the Southwest, and have six licensed operators at your service. We are proud of that. Give us a trial.

THE SOUTHWEST RADIO SUPPLY COMPANY

1812 Main Street,

Dallas, Texas

"Pioneers in Radio"



DONGAN

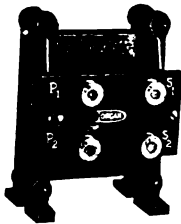
RADIO FREQUENCY TRANSFORMERS

are unexcelled for radio frequency amplification. The adjustable silicon core, (a patented feature) enables accurate tuning of the grid and plate circuit to the frequency of the incoming signals.—THE PEER OF THEM ALL.

DONGAN

AMPLIFYING TRANSFORMERS

embody the DONGAN standard of high grade workmanship throughout. Scientifically constructed.—Reasonable in price—Neat in appearance. Manufactured in ratios of 6-1 and 3 1/4-1.



Manufactured By

DONGAN ELECTRIC MFG. COMPANY

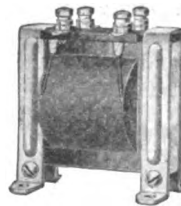
2983-2993 Franklin St.
DETROIT, MICH.

—Western Distributors—

SIERRA ELECTRIC COMPANY

301-304 Roberts Bldg., Los Angeles, Calif.
515 Market St., San Francisco, Calif.

"Superlative" Amplification



No. 41

You Can
Increase Your Range

Eliminate Howling
and Distortion

Bring out the full clear
tone in volume

WITH

JEFFERSON Amplifying Transformers

Furnished in two types either mounted or unmounted. Coils specially wound with No. 40 and No. 44 wire on a core of the finest rolled Silicon steel.

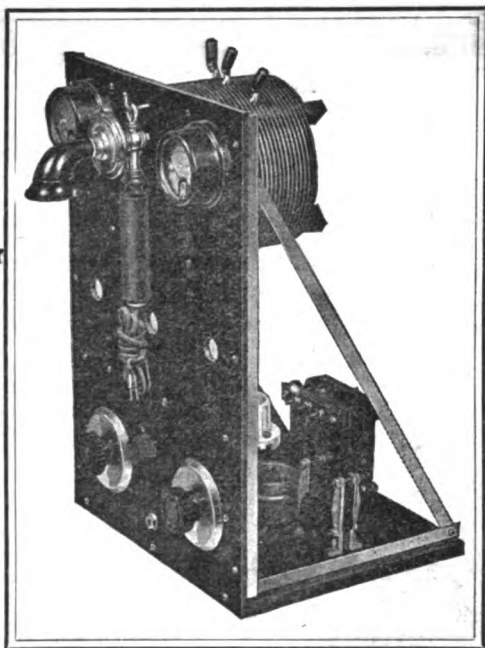
SEND FOR RADIO BULLETIN

PROMPT DELIVERIES

Jefferson Electric Mfg. Co.

425 S. Green Street,

Chicago



The BENWOOD CW Transmitter

Simple, compact, up-to-the-minute construction--incorporating all the improvements made possible by our years of experimenting and it gets results!

1500 Miles With CW!

1100 Miles Voice!

***Music Heard 40 Feet From Phones by
Stations in 300 to 400 Mile Radius***

THESE are actual results obtained by our testing station WEB using the Benwood CW Transmitter shown herewith. You can get just as good results with it. This high-class set is just the thing for your broadcasting and DX work—using CW, ICW, Modulated Buzzer or Voice Transmission. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union. It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design.

Radiates 1½ to 3 Amps on Average Antenna

We guarantee that this outfit will radiate 1½ amperes on the average amateur antenna when assembled in accordance with our instructions. It will radiate 2 to 3 amperes when used with an antenna whose fundamental wave length is 225 to 275 meters. That is why you can get such wonderful results. The set comes to you completely assembled with all parts mounted on panel, as shown, but not wired. Full instructions and wiring diagrams are furnished. You can wire it and start sending in less than an hour after you receive it. The outfit is complete with motor generator minus tubes, and consists of the following: Panel 12x18x¾, angle supports, hardwood base, 3 tube sockets, 1 power rheostat, 1 80 watt filament trans., 1 modulation trans., 1 CW inductance, 1 hand transmitter, 1 0-3 Radiation meter, 1 0-500 milliammeter, 1 21 plate condenser, 1 43 plate condenser, 1 tapped condenser, 1 L300 choke coil, 1 2000 volt filter condenser, 1 10,000 ohm grid leak, plug and jack connection for microphone buzzer and CW, 1 600 volt 220 watt motor-generator. Boxed for shipment, \$350.00 f. o. b. St. Louis, Mo.

CATALOG: Send 10¢ in stamps for the Benwood catalog and price list, also complete catalog and price list of DeForest radio equipment.

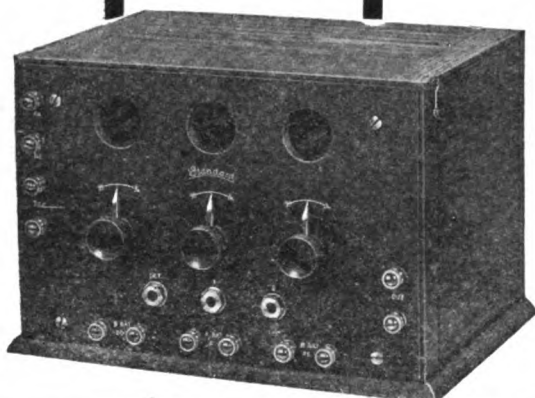
DEALERS: We manufacture a complete line of radio apparatus. We have stock on hand and ready to ship. Write or wire for our attractive proposition. New price list just issued.

The **BENWOOD** Co. INC.
RADIO
"WORLD-WIDE MAIL ORDER SERVICE"

1114 OLIVE STREET

ST. LOUIS, MO.

**The
Standard Idea
Assembled - But
Not Wired**



BUY your radio instruments in this new way—*this cheaper way*. Adopt the popular STANDARD IDEA and purchase high-grade instruments, including our Detector and Two-Stage Amplifier and our Multiple Wave Tuner, completely assembled — *but not wired*. You do the wiring yourself, according to simple directions, and save at least 20% in cost.

The wiring of instruments is the most expensive operation in our factory but when you do the job in your spare time you eliminate this costly hand labor and enable us to sell you the instrument at a great reduction. Thousands of fans are now following the STANDARD IDEA.

Ask us today for literature and prices and information regarding our offer to send any instrument for inspection on receipt of 1/3rd the purchase price.

Standard Assembling Co.
6 Stone St. NEW YORK, N. Y.

"East and West, the Globe is Best"

**GLOBE
RADIO HEAD PHONES**



Highly sensitive
Matched receivers
Natural in tone
Each receiver tested
by radio
Lightweight (11 oz.)
Comfortable to wear
Will not distort signals, when amplified
Articulation perfect

2200 ohms List price only \$9.00

There are many types of head sets on the market but not too many good ones. The GLOBE RADIO HEAD SET incorporates a knowledge of acoustics based on nearly fifteen years of experience in making high grade sound producing and receiving instruments. It embodies correct design with the best of materials. The Globe Phones are for those who discriminate.

Ask about the Globe Antenna Attachment Plug for connecting your radio set to your electric light circuit.

Buy from your local dealer, or write us direct.

GLOBE PHONE MFG. COMPANY

Earl C. Hanson, Technical Radio Expert

READING, MASSACHUSETTS, U. S. A.

**2nd DISTRICT
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Have you seen the 2nd. District magazine?

Do you know what your friends are doing?

Are you interested in club doings and real "How to Make It" articles?

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THE MODULATOR

It's only a dollar a year, or ten cents a copy. Published every month by

**The Executive Radio Council,
2nd District**

120 Liberty St., New York, N. Y.

Condensite



INSULATION is rarely subjected to more trying conditions than in radio. The high potentials used in sending, the varying climatic conditions, from the cold of the arctic to the heat of the equator, from the dryness of the desert to the saturated air of the tropics; the rough usage encountered at the hands of the unskilled, the remoteness from means of repair and replacement; all these and numberless other trying conditions make it imperative that for radio work the best insulation should always be used.

Condensite is the name of the insulation which will withstand these conditions, and which possesses all the properties essential to radio insulation.

Upon request we will send the list of radio manufacturers who make their equipment of Condensite.

Condensite Company of America

Bloomfield, N. J.

RHAMSTINE*

RADIO FREQUENCY TRANSFORMER

The Rhamstine* Radio Frequency Transformer brings to the radio enthusiast a highly efficient unit, handsome in appearance, convenient in mounting and wiring and surprisingly modestly priced.

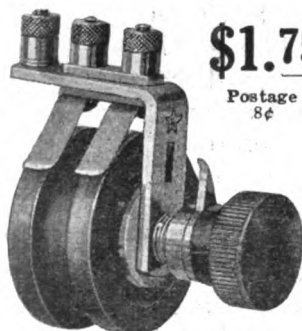
The Type 1 R.F. Transformer has a range of 200 to 500 meters—giving best results at the present broadcasting wave lengths. The transformer is fixed in the base with bayonet mounting, so instant changes of transformers for other wave lengths can be made.

In quality and performance, it leaves nothing to be desired; and its price makes it first choice in the field.



Pat. Apd. For

\$4.50
Postage 10c



\$1.75

Postage
8c

Carbon Element POTENTIOMETER

A Potentiometer in the circuit of a radio frequency set is necessary if full results are to be attained; and the Rhamstine* Carbon Element Potentiometer gives, we believe, a more uniform variation of potential than any other. It has all the advantages of the usual carbon element, yet it is unbreakable. Made for panel mounting.

Send Today for Descriptive Folder

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*Maker of Radio Products

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For REAL Service

Mail your orders to us. We can supply you with the BEST at the BEST PRICES. Shipments made within 24 hours after receipt of order.

CATALOGUE
\$22
AT YOUR
SERVICE

THE SERVICE RADIO EQUIPMENT CO.

Designers—Manufacturers—Distributors

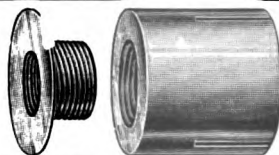
225 SUPERIOR ST.,

TOLEDO, OHIO

Our Radio Department is conducted by electrical engineers, which assure you dependable and highly efficient Radio equipment, either in complete sets or separate units, such as Head Receivers, Variocouplers, Variometers, Cabinets, Detectors, Antennas, Rotary Spark Gaps, Sliders, Panels, Dials, Knobs, Condensers, Grid Leaks, Contacts, Galena Crystals, etc. We especially recommend our popular Receiving Set, RESODON, which is one of the most desirable outfits for the home, club, etc. This set comes in a beautiful mahogany finished cabinet. Write for literature.



PAUL G. NIEHOFF & CO., Inc.
Electrical Laboratories and Manufacturers
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ATTENTION RADIOTICS
IF YOU USE AMPLIFYING TUBES you can make your Victor talking machine a RADIO LOUD SPEAKER, with a "BEEKO" Radio-Phone attachment. Sample by mail, 40c.

Liberal discount in quantities
J. H. BUNNELL & CO.

32 Park Place, Department Q New York



HEAD TELEPHONES

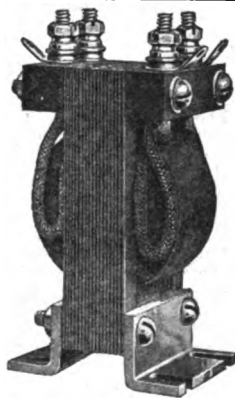
INCREASE THE EFFICIENCY OF YOUR SET

By Equipping It With

Federal PARTS

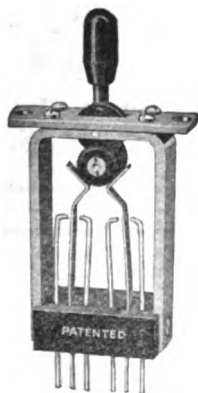
Federal Head Telephones

have earned their great popularity. Made by a company that knows how; of best materials adapted to this use; being light in weight and carefully MATCHED IN TONE They most perfectly reproduce RADIO SIGNALS.



No. 226-W

AUDIO FREQUENCY
TRANSFORMER



ANTI-CAPACITY
SWITCH

THE GOOD DX WEATHER

WILL SOON BE HERE. Don't forget to add the NO. 226-W AUDIO-FREQUENCY TRANSFORMER TO YOUR SET. You will be pleased with the result.

You will need other parts such as ANTI-CAPACITY SWITCHES, VACUUM TUBE SOCKETS, RHEOSTATS, POTENTIOMETERS, CONDENSERS, JACKS, PLUGS, KNOBS and DIALS, GRID LEAKS, Etc.

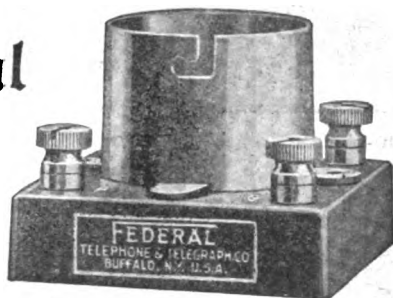
For Best Results Be Sure You Get

GENUINE

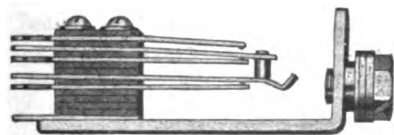
Federal



No. 5 TELEPHONE SHUNTING
CONDENSER



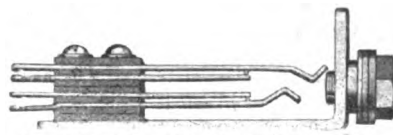
No. 16 V. T. SOCKET



No. 1438-W FILAMENT CONTROL JACK



No. 15 PLUG

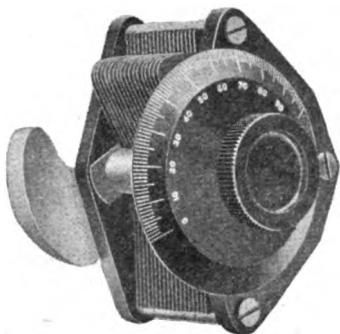


No. 1423-W DOUBLE CIRCUIT JACK

Federal Telephone and Telegraph Company

BUFFALO, N. Y.

WRITE FOR BULLETIN No. 115-W and No. 119-W.



CHELSEA Variable Condenser (DIE-CAST TYPE)

No. 1—.0011 m.f. mounted.....	\$5.00
No. 2—.0008 m.f. mounted.....	4.50
No. 3—.0011 m.f. unmounted.....	4.75
No. 3a—.0011 m.f. unmounted, without dial.....	4.35
No. 4—.0008 m.f. unmounted.....	4.25
No. 4a—.0008 m.f. unmounted, without dial.....	3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates. Unmounted types will fit any panel and are equipped with counterweight.

Guaranteed for circuits up to 1,000 volts.

#3 Price \$4.75

Amplifying Transformer No. 50

The Chelsea Amplifying Transformer gives the highest amplification possible and at the same time will not squeal, howl, or in any way cause noisy circuits. It is beautiful in design and embodies electrical characteristics unequalled by any. Guaranteed for all circuits up to 500 volts with a high safety factor.

It will not fall in service.

Purchase Chelsea Radio Equipment from your dealer. If he does not carry it send to us.

Write for our new \$6 catalog.



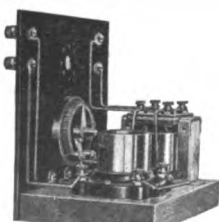
Price \$4.50

CHELSEA RADIO CO., 150 FIFTH ST., CHELSEA, MASS.
Manufacturers of Radio Apparatus and Moulders of Bakelite and Condensite

SIMPLEX—that's your safeguard



VARIOMETER PANEL VARIOMETER PANEL



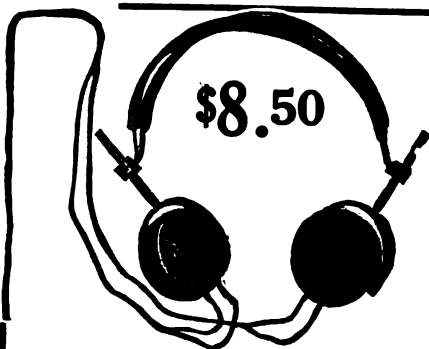
ETECTOR PANEL AMPLIFIER PANEL
Also Unmounted Variometers & Variocouplers

Simplex Panel Units make it possible to try out any different hook-ups without disassembling panels. These highly perfected units eliminate much of the uncertainty of success in receiving radio broadcasts because they have been designed by men having years of experience in radio activities. Get them from your dealer.

SIMPLEX RADIO CO.

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\$8.50

Complete Enjoyment of Radio Telephony

is only possible with a Telephone of the very highest standard of efficiency.

Everett Double Radio Phones

have satisfied the most exacting Critics

Supersensitive—Clear—Light

Mechanically Perfect—Moderately priced

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WESTINGHOUSE

RADIO

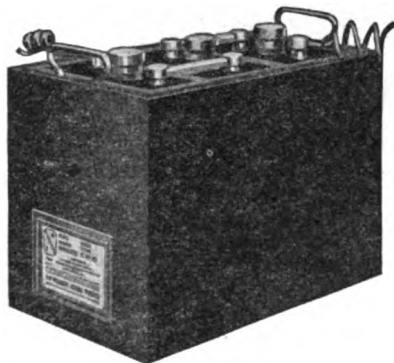
⚡ BATTERIES ⚡

Eliminate all Battery Troubles from Radio Sets

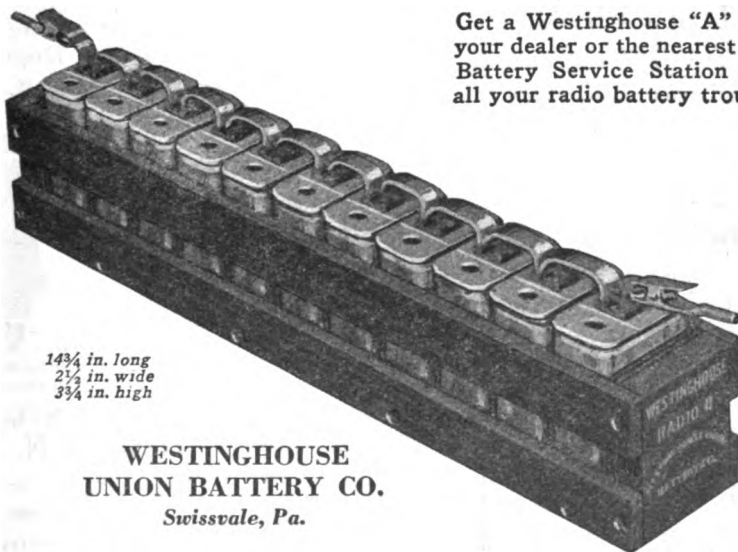
The Westinghouse "A" Battery is a full capacity, low voltage, slow discharge, long-life storage battery built exclusively for radio work.

For "B" battery requirements Westinghouse has perfected a baby storage battery. No more throwing away exhausted cells. No more continuous "B" battery expense.

The Westinghouse "B" is a permanent battery. It never has to be replaced. It will discharge its load with constant, steady voltage. Then it can easily be recharged. It gives continuous service to the point of exhaustion without growing "scratchy." If your vacuum tube is inclined to be noisy you can adjust the contact on the Westinghouse "B" to take off the exact voltage the V. T. requires.



Get a Westinghouse "A" and "B" from your dealer or the nearest Westinghouse Battery Service Station and eliminate all your radio battery troubles.



14¾ in. long
2½ in. wide
3¾ in. high

WESTINGHOUSE
UNION BATTERY CO.
Swissvale, Pa.

***"The best
Westinghouse
can build."***

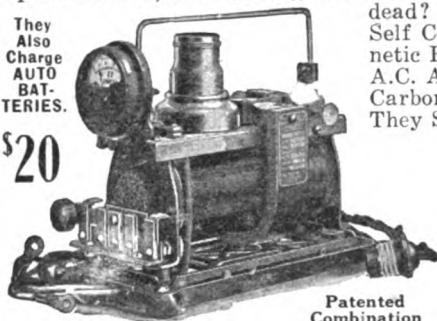
RADIO "A" & "B" STORAGE BATTERIES CHARGED AT HOME F-F RADIO RECTIFIER

FOR A FEW CENTS, FROM ANY 100 to 130 Volt 60 Cycle LAMP SOCKET, WITH AN

It Charges All 6 Volt RADIO "A & B" & Auto Batteries; & RADIO "B" Storage Batteries Up to 120 Volts. It has Unlimited LIFE at Constant EFFICIENCY, with Nothing to Slop over, Burn Out, or cause trouble and It Will Charge a Dead Battery. They Charge Automatically, Operating Unattended. Leave Battery where it is, without even disconnecting it; Screw Plug in Lamp Socket, Snap Clips on Battery Terminals; Turn Switch & Battery will be Charged in the morning. Is it not gratifying to feel that Your Radio Batteries will never fail & You are always Ready to Receive Radiophone Broadcast Music, Speech & News; never having to be careful of or to have to tell Friends that Your Batteries are dead? F-F BATTERY BOOSTERS are Complete Compact Self Contained Portably Handy Full Wave Automatic Magnetic Rectifying Charging Units, for 100 to 130 Volt 60 Cycle A.C. Also For Other Cycles. No Skill is Required. Infusible Carbon Rectifying Brushes Maintain Uninterrupted Service. They Save You 75¢ a Charge & Last a Lifetime. POPULAR PRICES:

They Also Charge AUTO BATTERIES.

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Patented Combination

Type 6 for 6 Volt "A" Battery, Charging at 6 Amperes \$15
Type B Charges Radio "B" Batteries Up to 120 Volts \$15
Type "A-B" Combination Radio Rectifier for Charging 6 Volt "A" & Auto Storage Batteries and Up to 120 Volts of "B" Storage Battery \$20
Type 12 for 12 Volt Battery, Charging at 5 Amperes \$15
Type 16 for 6 Volt Battery, Charging at 12 Amperes \$20
Type 16 12 Charges 12 volt Battery at 7 amperes \$20
Type 16 26 is a Combination of Both Type 16 & 12 \$28

Eventually You Will Buy An F-F Rectifier. Why Not Now? It Costs You Less To Buy a Booster Than To Be Without One All Types But B charge Auto Batteries. The Larger Types are for heavy Batteries, or Where Time is limited. Shipping-Weights Complete With AMMETER & BATTERY CLIPS 11 to 15 lbs. Purchase from Dealer, or Mail Check for Prompt Shipment. If via Parcel Post add Postage & Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge Batteries from Farm Lighting Plants & D.C. Circuits & For GROUP CHARGING use our 12 Battery 8 Ampere Full Wave Automatic ROTARY Rectifier described in FREE Bulletin No. 31A. ORDER Now or WRITE Immediately for FREE BOOSTER Bulletin No. 31.

THE FRANCE MANUFACTURING COMPANY OFFICES & WORKS
CLEVELAND, OHIO, U.S.A.
Canadian Representative: Battery Service & Sales Co. Hamilton, Ontario, Canada.

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We offer to the amateur and dealer

REAL PANEL SERVICE.

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8" per square inch \$0.02
3/16" per square inch .02 1/2
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We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

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"Pittsburgh's Radio Shop"

Desk B

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The Wise Amateur Radio Operator Guides by the Judgment of the Experienced Engineer—He Depends Upon the BRACH Lightning Arrester.

The Brach Arrester robs lightning and static of its terrors and nullifies interference with reception of signals and voice currents.

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Outdoor Type—\$3



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16 Years Specialists in Lightning Protective Apparatus.
COAST REPRESENTATIVES—Pacific States Elec. Co., San Francisco, Los Angeles, Oakland, Seattle, Portland, Spokane.



Means RADIO Satisfaction

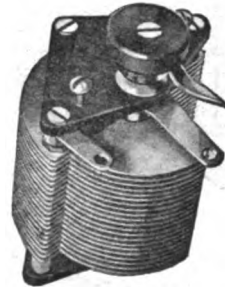
Radio equipment—whether you construct your own apparatus or buy the “custom-made” outfit—must be **made right**, or you cannot expect lasting satisfaction.

SIGNAL parts and sets are the product of a plant and an organization whose experience in making Radio equipment dates back to the earliest days of “wireless.”

There is seasoned knowledge and experienced handicraft built into every item of the SIGNAL line. Each piece will give you the service you have a right to expect.

Ask for SIGNAL when you want Radio parts or Radio sets and insure yourself against that “most embarrassing moment” when something goes wrong, just as you expect to entertain your friends.

For sale by dealers everywhere.
Accept no substitutes.



We this month reproduce a picture of the **Signal Back Mounted Variable Condenser** because you cannot be told too often nor too much about it. Just one item of the Signal Line, it is quality through and through, built to be banged around more than the ordinary type condenser. We build Signal Condensers in three models to permit mounting on panels from $\frac{1}{8}$ to $\frac{3}{8}$ inches thick. Each instrument has metal scale calibrated to 180° . Knob and pointer are removable. The material in the aluminum plates is thicker than usual.

For convenience use this coupon; get it off to us today.

COUPON

Send me the new Signal Wireless Bulletin W.

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Company

City

State QST

SIGNAL

Electric Mfg. Co.

1915 Broadway

Menominee, Michigan

33 So. Clinton St., Chicago

(1856A.)

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

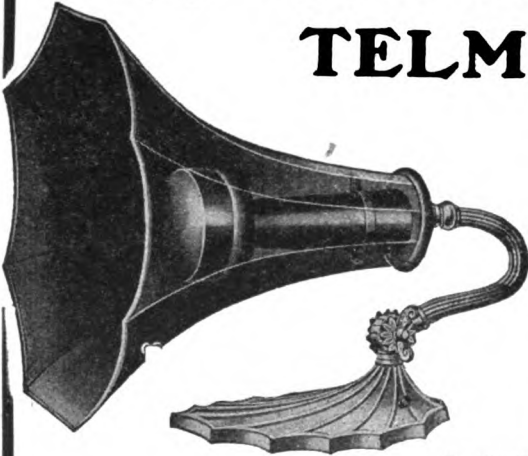
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Stands for

Dependable Radio Equipment

TELMACOPHONE



A Telmaco product for Which We Are Having A Phenomenal Demand.

Scientifically Constructed.

Unreservedly Guaranteed.

Reasonably Priced.

Complete with Type C. Baldwin Unit Attached—\$20.00.

DEALERS: We are distributors for nearly all standard lines. Full discounts on the Telmacophone. Write for proposition on our complete line.

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TELEPHONE MAINTENANCE CO.

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ARE YOU PREPARED?

We can supply you with anything on the market for that C.W. set you are going to use.

C us about CW

Catalog 5c

Anthracite Radio Shop

P. O. Box 3 Scranton, Penna.

CHASLYN PATENTED "SINK-OR-SWIM" BALL BATTERY TESTER \$1.00

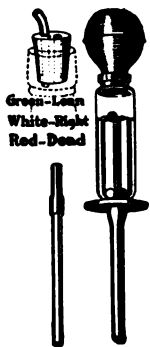
Specific gravity shown instantly by floating or sinking of colored balls.

Accurate — Simple — Won't break if dropped. Tester, Water Filler and Depth Gauge—

All for a Dollar Bill.

Send One Dollar and your dealer's name and address and set will be mailed you.

The Chaslyn Co.
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Green—Live
White—Bright
Red—Dead

The OGDEN WIRELESS LABORATORIES

THE O.W.L. RHEOSTAT

Patents pendings

An instrument of real Value, NO THERMO-ACTION resulting in distortion because all parts are made of the same resistance alloy throughout.

PRICE - - \$1.00

1012 Ogden Ave.,

New York City



The Willard Radio "B" Battery with glass jars and Threaded Rubber Insulation is the most practical insurance against leakage noises and leakage losses.

Why Gamble on "B" Batteries?

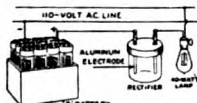
You're careful in soldering connections. You spend good money for additional stages of amplification. You give special attention to insulation of aerial and lead-in.

If you've gone that far, you simply can't afford to take a chance on having a leaky "B" Battery spoil it all with a bombardment of leakage noises. *You can't afford anything less than a leak-proof Willard "B" Battery.*

Every cell of a Willard "B" Battery is an individual glass jar. Jars are well-spaced to prevent leakage from cell to cell. Threaded Rubber Insulation protects the plates and thus guards against inside leaks.

Because of the leakproof feature Willard "B" Batteries are unusually quiet and hold their charge for long periods.

Ask your radio dealer or the nearest Willard Service Station to show you the Willard 6-volt Radio "A" Battery and the Willard 24-volt Radio "B" Battery.



This rectifier will keep your "B" Battery charged at a cost of a few cents a month

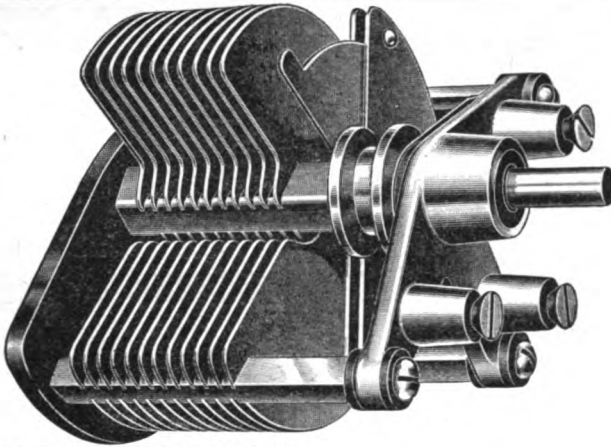
**WILLARD STORAGE BATTERY COMPANY
CLEVELAND, O.**

Made in Canada by the

Willard Storage Battery Company of Canada, Limited,
Toronto, Ontario

Willard

THREADED RUBBER BATTERY



THE SEXTON CONDENSER

With Vernier control entirely eliminates the necessity for delicate tuning of a receiving set.

The single knob and dial control makes it possible for anyone to obtain desired results.

Alden L. McMurtry Licensee

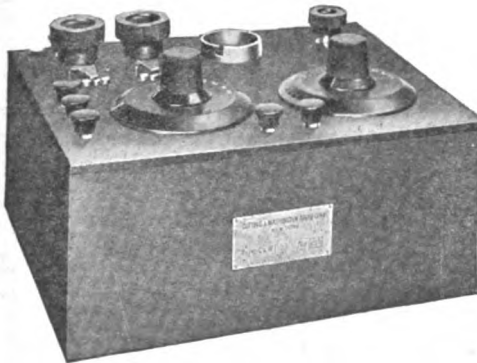
PRICE—43 PLATE	\$7.00
PRICE—23 PLATE	6.50
PRICE—11 PLATE	6.00

Complete information upon request. Send Postal Card stating type of Receiving Set.

HARTFORD INSTRUMENT CO., Inc.

252 ASYLUM STREET,

HARTFORD, CONN.



Type C & W No. 12

Manufactured By

The Cutting & Washington Radio Corp.

An ideal receiver for telephone, C.W. and spark reception.

Descriptive literature sent on request.

We handle a complete line of parts and equipment, May we serve you?

"NEW RAD"

The mark of satisfaction.

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Dealers:--

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WE ARE JOBBERS FOR

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Federal, Fada and
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Write for Our Special Proposition "A"

**THE RADIO SHOP
— OF NEWARK —**

**41 South Orange Ave.
NEWARK, N. J.**

MURDOCK RADIO

WHEN men everywhere *insist* on Murdock apparatus, we realize that *quality* manufacture has imposed on us a *quantity* obligation, sometimes hard to meet.

Examine Murdock apparatus at your dealer's.

There are no other phones so good at so low a price. *After you have* bought, a 14 day trial privilege assures satisfaction with your purchase.

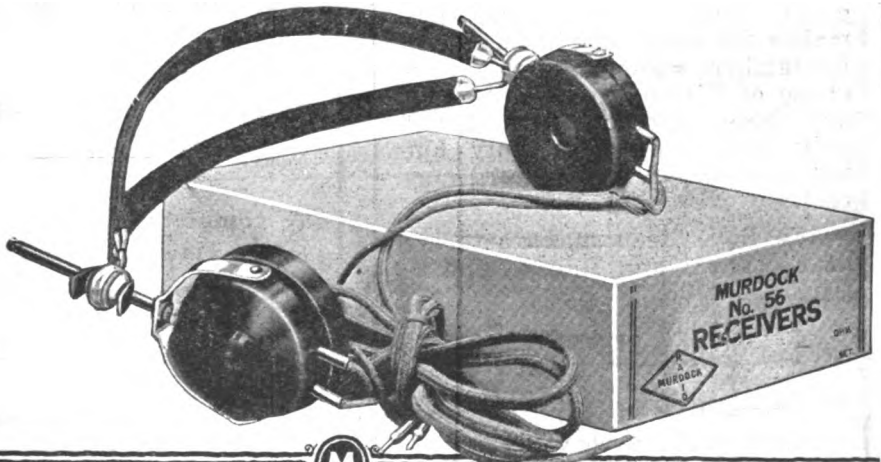
WM. J. MURDOCK COMPANY

343 Washington Avenue,
1270 Broadway,
509 Mission St.,

Chelsea, Mass.
New York City
San Francisco, Cal.

No. 56—2000 Ohm—\$5.00

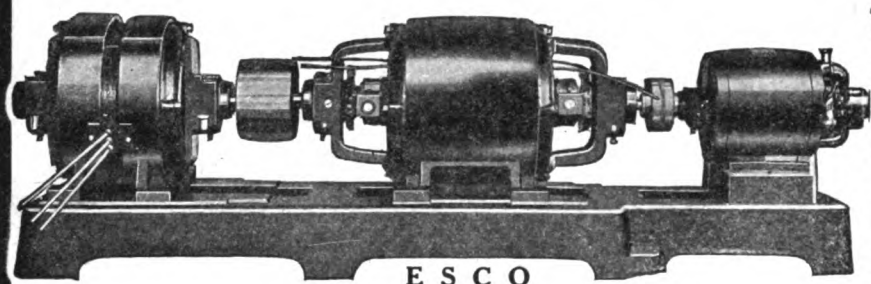
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ESCO

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The things that
have endured
for ages were
made of qual-
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things have
passed on—
and are for-
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High Voltage Motor-Generators stand pre-eminent.—Used by Leading Educational Institutions—U. S. Army & Navy Academies—Research Labs.—Newspapers—Department Stores & Broadcasting Stations.

Bulletin 237 Lists Over 200 Combinations.

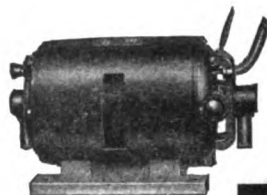
Special Apparatus Developed for Special Requirements.

**MOTORS — DYNAMOTORS — GENERATORS —
MOTOR-GENERATORS**

Sold By Principal Dealers Everywhere

ELECTRIC SPECIALTY CO.

215 SOUTH STREET, STAMFORD, CONN., U. S. A.



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It is an electrical principle that the greatest effect will be produced in a magnet when there are the greatest number of ampere turns within a given space.

It is this magnetic effect, and not the resistance caused by the great length of fine wire, that makes for sensitivity in receivers. Remember, when making a purchase of Elwood Head Sets, you are obtaining receivers, with not only full ohmage capacity but with this scientific standard correctly worked out.

We have been manufacturers of Electrical and Radio apparatus since 1905.

ELWOOD ELECTRIC CO. INC.

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*We make 3 different types
in 2000 and 3000 ohm sets.*

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L LOCATED IN OUR L
O NEW HOME AND CAN O
O PROMISE OUR USUAL O
K SERVICE K

**ORDERS SHIPPED SAME DAY
THEY ARE RECEIVED**

**A complete stock of parts and
finished apparatus.**

ROSE RADIO SUPPLY

Pioneers in the Radio Field
129 CAMP ST., NEW ORLEANS

Send 10c for latest catalogue

RADIO MERCHANDISE

F. D. PITTS CO.

Incorporated

219 COLUMBUS AVENUE, BOSTON, MASS., U.S.A.

Announces a change of Policy

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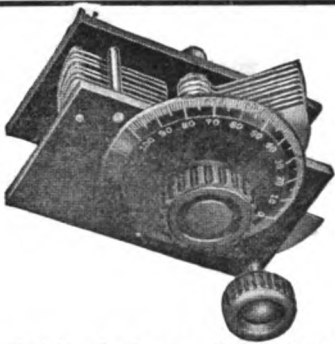


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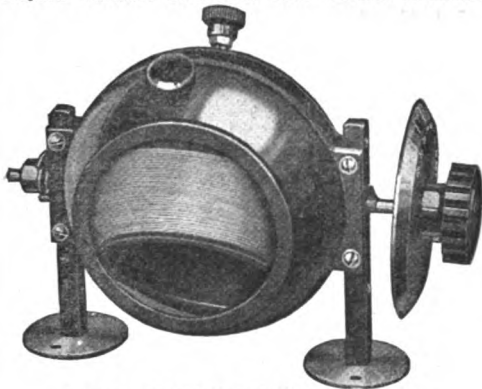
A. H. Grebe & Co. (New England)	Frank A. D. Andrea
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Dealers are urged to send for our latest stock sheets, listing desirable radio merchandise for immediate delivery at attractive discounts.

The retail and mail order business formerly conducted by the F. D. Pitts Co. at 12 Park Square, Boston; Providence, R. I. and Springfield, Mass., is now operated by the "Pitts Radio Stores, Inc." at the same addresses.



Dayton Variable Condenser with Vernier Attached



Dayton Moulded Bakelite Variometer

DAYTON Radio Products

A complete and meritorious line of Radio parts with every article guaranteed for accuracy and its capacity in Micro-farads. Sold only thru legitimate Jobbers, Dealers and Manufacturers. Variable and Vernier Condensers are made of hard aluminum plates mounted on Bakelite Panels; furnished with either square or round panels.

Type 3 P. C. Vernier with Knob.....	Price \$2.00
Type 9 P. C. Condenser Cap. .0003 Mf....	Price 3.35
Type 17 P. C. Condenser Cap. .0005 Mf. Price	3.95
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Type 45 P. C. Condenser Cap. .0015 Mf. Price	5.65
Condensers with Vernier attached 80c extra	
Variometers Bakelite Tube Type.....	Price 4.50
Variometers Moulded Bakelite.....	Price 7.50
Vario-Couplers Bakelite Tube Type.....	Price 5.00
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Rubber Insulating Tubing (10 ft. Packages)	.45

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Super-Regenerative Circuit necessary parts and supplies AT ATTRACTIVE PRICES

Blueprint with details.....	\$.35
V. T. Sockets, 90c; Rheostats.....	.90
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.001 Plate Condenser.....	4.55
Triple Coil Mountings.....	4.75
Double Coil Mountings.....	3.55
Single Coil Mountings.....	.55
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1250 Coils, \$3.20; 1500.....	3.70
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Manhattan 2000 Ohm Headsets.....	5.55
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R3 Magnavox.....	42.50
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All Standard makes on a money back guarantee. Prepaid anywhere in the U. S. when check accompanies order.

Standard Radio Supply Co.
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RADIO CITIZENS

Complete stocks carried for immediate shipment of the following apparatus:

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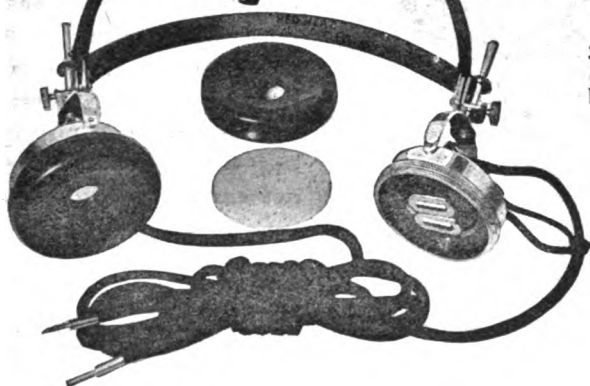
**FREE BULLETINS
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Get the new lowest prices on apparatus and supplies. Bulletins and price lists mailed FREE on your request. Send for them today.

Nash Electrical Service Co.
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'RED-HEADS'

A Triumph in Radio Receiver Design



3000 ohms, complete with
cord and military head-
band.

—NOW
\$6.50

At the new price of \$6.50 per pair, "Red Heads" represent today's
biggest value in radio headsets

SPECIFICATIONS

EACH "Red Head" receiver is wound to 1500 ohms (3000 ohms per pair) with highest quality electrolytic copper on accurately ground pole pieces attached to the best magnet steel procurable for the purpose. Machine-finished aluminum backs with strain posts and nicked binding posts. Ear caps of scientific design, moulded from our special red-brown composition, comfortably fitting the ear. High quality, fully adjustable military type head-band with seamless tape binding. Green mercerized cord. Careful workmanship and distinctive appearance. *Fully guaranteed.*

IT'S A FACT THAT

"RED-HEAD" 'Phones at \$6.50 are the lowest priced, high-grade, 3000-ohm, aluminum cup receivers on the market. The new price is possible only because of greatly increased production and cleverly improved facilities. Not one iota of quality has been sacrificed.

The same super-sensitive, clear-toned "Red-Head" Receivers—tested and approved for seven years by the critical amateur fraternity—originally priced at \$12.50 and then \$8.00—are now available at the markedly reduced list price of \$6.50.

"RED HEADS" WILL BE THE POPULAR RECEIVERS THIS SEASON

For sensitiveness, for mechanical perfection and for durability, "Red Heads" easily surpass any 'phones ever offered at anything like the \$6.50 price. Their genuine merit has created a country-wide demand for "Red Heads." The new low price will vastly increase their popularity everywhere. At your dealer's, or sent direct on receipt of price.

Newman-
Stern
Bldg.

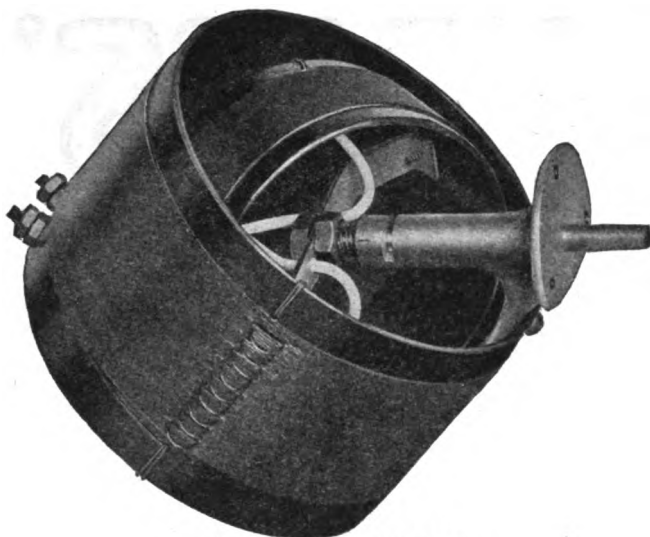
The Newman-Stern Co

Cleveland,
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N.B.

Have you observed how the Teagle line of radio products is coming to the front? "Demonstrated merit" is the reason. We are the producers of Teagle Rheostats, Sockets, Condensers, Detectors, Crystal Receivers, Adaptaphones, etc. Like Newman-Stern "Red Heads," they give the utmost for the money and the maximum of satisfaction. They must. For like our "Red Heads," they're fully guaranteed.





THE PERFECT MOUNTING
PAT. PEND.

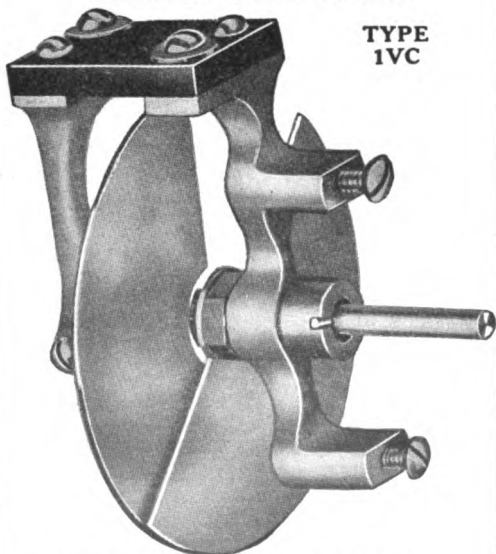
LORAIN

The only coupler especially designed for Perfect Panel mounting. A few distinctive features are:—Formica tubing—No. 22 DSC wire—one piece $\frac{1}{4}$ " brass shaft, runs true with panel. NO WOBBLE. Flexible leads to rotor—Rigid, easily cleaned taps—Excellent workmanship and finish—Price \$5.50. For complete description send for circular C2.

If your dealer cannot supply you—order direct and send us his name. Dealers write for discounts.

LORAIN RADIO SUPPLY CO., Lorain, Ohio

THE NEW 'WHITE' ADJUSTABLE VERNIER CONDENSER



TYPE
1VC

A NECESSITY FOR SHARP TUNING
Positively noiseless. Highest grade, mechanically and electrically. Exclusive features.

PRICE, at your Dealers or Post Paid.....\$2.50

THE O. C. WHITE COMPANY

Makers of Adjustable Electric Fixtures
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Radio or Automobile
SAVE YOU 50%

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Give year and model
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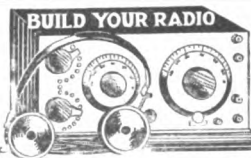
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6 Volt, 40 Amps	\$8.50
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World Battery Co.,

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SAVE MONEY

Build Your Own At Home
Complete Standard Parts
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Outfits. We do all machine work; you do the hand work; we tell you how. Immediate delivery. Also complete Radio Sets—all sizes at bargain

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B & B W400

IT HAS a voltage step-up of 4—uniform over the *entire* audio frequency range. Remarkable freedom from *distortion* or “howl.” Compact construction and convenient terminals. Designed and made by a house of long standing in the electrical trade, specializing in transformers, whose reputation would not permit offering a transformer before developing it to a point of demonstrated superiority.

TEST IT yourself. Compare the B & B with any transformer at any price. Put it in the same circuit, on the same signal, using a 4P.D.T. switch for quick change. You will find a quality of signal and a range of operation which you have never been able to get.

We will pay You \$2.50 to test this remarkable Transformer

HERE IS a *real* audio frequency transformer. Three of the leading electrical testing laboratories have proven its marked superiority. Its outstanding merit appears not only in the tabulated figures of its definite characteristics, but is very evident in the improved quality of signals received.

THE PRICE of this great little transformer is \$7.00. Its *value* is greater. Cut out and mail the coupon below with \$4.50 and you will receive one B & B transformer postpaid. This pays you \$2.50 for testing and proving its superiority.

Not more than two transformers will be sold to one person on this basis. The regular price is \$7.00. Order, test, prove the unequalled quality of B & B transformers, and you will always use them, because they do give better results.

Every B & B W400 audio frequency transformer is sold with the maker's money-back guarantee. If not found superior in quality, it may be returned and full price paid will be refunded.

Sold only by the better class of dealers.

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CORPORATION

645 West 43rd St., New York

Makers of B & B Variometers, V. T. Sockets and Receiving Apparatus

Betts & Betts Corporation,
645 West 43rd St.,
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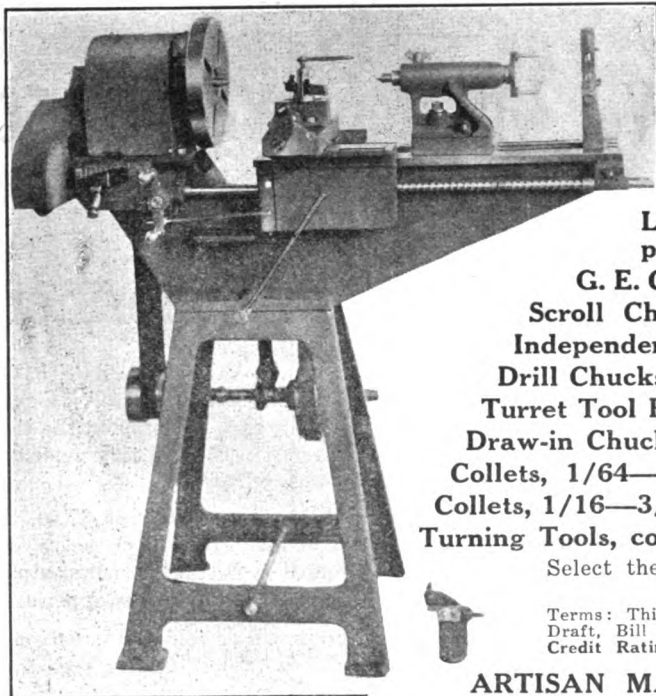
Enclosed find.....for { \$4.50 } for which
please send me postpaid { one } \$9.00
{ two } \$7.00 B & B W400 audio frequency transformer, the difference being allowed to me for testing. In case I do not find the transformer to be of superior quality and entirely satisfactory I am to have the privilege of returning to you within 10 days and having my money refunded.

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Street

City & State.....

Please write plainly. Money should be sent by P. O. money order. Stamps not accepted.



THE ARTISAN 11" x 24" GAP LATHE

(See description in
August QST)

For making Radio Parts;
The Solution of the Slow
Delivery Problem.

Prices—F.O.B. Cincinnati

Lathe, completely equip-
ped \$139.00

G. E. Co. 1/2 H.P. Motor \$40.00

Scroll Chucks fitted.... 16.00 up.

Independent Chucks fitted 20.00 up.

Drill Chucks fitted..... 5.00 up.

Turret Tool Post, complete.. 26.00

Draw-in Chuck, complete.... 18.00

Collets, 1/64—1/2" cap..... 3.00 ea.

Collets, 1/16—3/4" cap..... 4.00 ea.

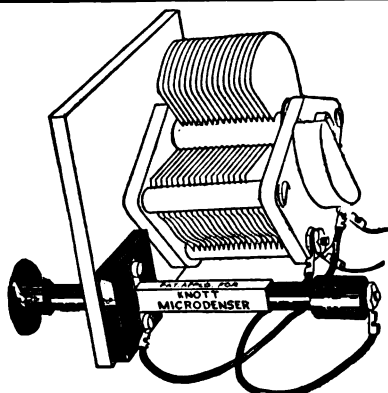
Turning Tools, complete..... 1.80 ea.

Select the Equipment needed for your
Work

Terms: Third cash with order, balance sight
Draft, Bill of Lading attached, in absence of
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ARTISAN MANUFACTURING CO.

Station "N," Cincinnati, Ohio



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Showing how you connect to Condenser
Tune in that message or music you have been
losing Tune out that interference. Bring it in
and clear it up.
Tune your condenser to the whistle and then
bring in the messages with this Micro.
Buy it of your dealer, or send us \$2.75 and
we will mail you one complete with connecting
wires and wrench-screw driver.
Knott Sure Ground. Radio Name Plates. Patent
Dial. Rheostat. Quodcoil. Cinqucoil. Microstat.
Send 2 cent stamp for Circulars.
Jobbers write for our proposition It will please
you.



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22½ - 45 & 105 VOLTS



NOISELESS
DEPENDABLE
GUARANTEED

ASK YOUR DEALER

NOVO MANUFACTURING CO.

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Where You See
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Mr. Dealer:—If you are a
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Baldwin Radio Products are Standard



VARIOCOUPLER
\$5.50

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BALDWIN
RADIO FREQUENCY
TRANSFORMER
\$3.50

KNOWN the world over for efficiency.

Made in accordance with the best engineering practices of the radio art.

They never fail to bring in the **MUSIC** and they are **Positively** Guaranteed, Electrically and Mechanically to function properly.

Make your own set with Baldwin parts. Ask your dealer. Write for catalogue "E" free.

Dealers Write for Liberal Discounts

**BALDWIN RADIO ELECTRICAL
MANUFACTURING CO., Inc.**

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BROOKLYN, N. Y.

10% OFF

Besides the articles listed below, which are quoted at 10% below the regular list price, we can also supply you with any piece of radio apparatus, including sets, at the same discount. Write for our price before buying.

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Murdock No. 55, 2000 OHM	4.50
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Brandes Superior	6.75
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VT-1 Western Elec. Co.	\$7.50
VT-2 Western Elec. Co.	8.50
U-V-200	4.50
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DX Radio Frequency	\$7.75
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Acme Audio	4.50
Thordarson	3.85
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Atwater Kent	\$6.75
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Black Moulded Variocoupler	4.50
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Every article we sell at these reduced prices is a standard product. Write us about your needs, you'll find we are the lowest in price.

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CUT RATE RADIO CO.

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MICRODENSER

The friendly feeling which the Radio Public is displaying toward the MICRODENSER is no doubt prompted in part, by its novel design.

But the deeper, more significant phase is the profound admiration for its fine tuning qualities, selectivity and permanent adjustments.

PRICE \$7.50
Complete with Dial & Knob

THE FIRST VARIABLE DIELECTRIC CONDENSER WITH A VERNIER ADJUSTMENT.

RaFone Variometers, \$3.80

Variocouplers \$3.80

R. S. TYPE FIXED CONDENSERS

.001 Phone Condenser	\$0.35
.00025 Grid Condenser	.35
.00025 Grid Leak Condenser detachable	.50

THE RADIO SHOP

Dept. B

242 W. Adams Ave., Detroit.
Canadian Distributors Potvin, Herbert & Potvin,
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Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. CO.

521 Penn Ave., Wilkinsburg, Pa.

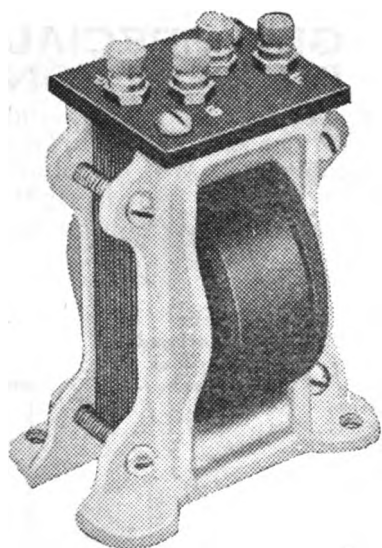
Armstrong Super Regenerative Circuit

Complete blue-print and descriptive matter \$0.25
400 turn Honey-comb Coils (unmounted) 1.00
1250 turn Honey-comb Coils (unmounted) 2.40
1500 turn Honey-comb Coils (unmounted) 2.80
Add \$1.00 to above prices for mounted coils.

We can also supply the necessary choke coils and 12,000 ohm resistances used in this circuit.

Dealers write for Discounts

FRANKLIN RADIO MFG. CO.
711 Penn Ave., Wilkinsburg, Pa.



PRICE \$6.00

The 3YQ safely meets the exceptional demands of the new Armstrong Super-Regenerative Circuit.

3 Y Q Transformers are not built for incredible and needless voltage amplification—they are built for **efficient** amplification. 3 Y Q Transformers are leak-proof because no impregnating compounds are used for insulation. They are wound with larger wire than any other Audio Frequency Transformer so that their impedance is correct without being made up largely of resistance. They work with any present day tube. They are electrically and mechanically

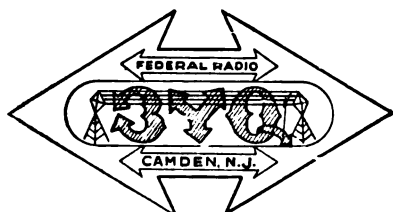
DISTORTION **Can Be--Has Been** **ELIMINATED**

*Experimenters and music lovers use
3 Y Q Transformers for
"Amplification without Distortion"*

Howling and distortion have been eliminated from Radio by the 3 Y Q Audio Frequency Transformer. New laws, new methods of construction, have been developed. Old ideas have been improved—some have been discarded—and as a result you can now secure Audio Frequency Amplification that is surprisingly efficient.

perfect, have no exposed wiring to break or short circuit, and they can't be connected incorrectly. And they are tested to stand 600 Volts A C, proving them ideal for power amplification.

Many amateurs and professional assemblers demand the 3 Y Q Transformer in preference to all others. You, too, want the best—and you can be sure of getting it by asking your dealer for the 3 Y Q. Remember the name, 3 Y Q, and the price, \$6.00.



Federal Institute

of

Radio Telegraphy

2nd & Federal Sts., Camden, N. J.

DEALERS GET SPECIAL PROPOSITION

Send to KLAUS—"Radio Headquarters" for special discount lists and bulletins on apparatus and equipment. Our service department offers dealers assistance and advice on radio problems. We distribute "tested" apparatus. We know the equipment we send you is right. We want all Agents and Dealers to get our special proposition on the best lines of apparatus made.

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Baldwin
Brandes
Westinghouse

Clapp-Eastham
DeForest
Jewell
Federal
Radio Corporation

Grebe
Moorhead
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Write today to---

KLAUS RADIO CO.

Dept. 100

Eureka,

Illinois

FIRST TESTED ~ THEN SOLD

**Our New Price List is
Ready. Get Your Copy**

Immediate deliveries on
Radio Corporation
Magnavox
Grebe
Amrad
Clapp-Eastham
Tuska
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Thordarson
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Cunningham
Frost
Federal
& Others

Detroit Electric Co.

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DETROIT,

MICH.

HYGRADE SPECIALS

Radiotron U. V. 200 Tubes.....	\$4.75
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45 Volt Cyclone Variable B. Battery.....	2.75
Electrose Insulators per dozen.....	2.00
7 Stranded Copper Aerial Wire 200 ft....	1.25
Arkay Loud Speakers.....	4.00
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Thordarson Amplifying Transformers.....	3.89
Acme Amplifying Transformers (Semi- Mounted).....	4.25
Federal Amplifying Transformers.....	6.25
Skinderviken Transmitter Buttons.....	.75
Murdock 256 Head Set 3000 ohm.....	5.75
Murdock 256 Head Set 2000 Ohm.....	4.75
Federal 2200 Ohm Head Set.....	7.25
Dictograph 3000 Ohm Head Set.....	9.95
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Rheostats. Fada 90c—DeForest.....	1.05

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6 volt 30 amp. guaranteed 2 years....	\$10.00
6 volt 60 amp. guaranteed 2 years....	13.50
6 volt 80 amp. guaranteed 2 years....	17.00
6 volt 100 amp. guaranteed 2 years....	21.00
Homcharger, charge your own battery..	16.50

Above prices are F. O. B. New York

HYGRADE ELECTRICAL NOVELTY CO.

41 West 125th Street, New York, N. Y.



It's easy. make your own
INDOOR COIL AERIAL

Drawing, R. F. amplifier circuit, chart and tables giving proper number of turns to put on coil for any wavelength. Complete data covering 0 to 24,000 meters on 3 large sheets \$1.00. Stamps not accepted
C. A. DAVIS & COMPANY

2371 Champlain St., Washington, D. C.



Mignon Condensers

Straight, Curve, Variable



Balanced TYPE "A"

Types "A" and "B" BALANCED CONDENSERS

"A" 8 STATORS and 6 ROTORS
"B" 14 STATORS and 12 ROTORS

Special Aluminum Plates
FORMICA Inserts & Nickel Plated
Terminal Posts, Diameter of Aluminum
End Castings $4\frac{1}{2}$ "
Outside Dimensions Between End Cast-
ings "A" $2\frac{3}{4}$ " and "B" $3\frac{1}{2}$ ".
 $\frac{1}{4}$ " Rotor Shafts.

As illustrated

"A" .0005 M.F. \$4.50
"B" .0008 M.F. \$5.00



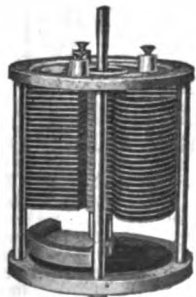
Types "B" and "C" COUNTER BALANCED CONDENSERS

"B" 13 STATORS and 12 ROTORS
"C" 23 STATORS and 22 ROTORS

Special Aluminum Plates
FORMICA Inserts and Nickel Plated
Terminal Posts. Diameter of Aluminum
End Castings $4\frac{1}{2}$ inches.
Outside Dimensions Between End Cast-
ings "B" $3\frac{3}{8}$ " and "C" $4\frac{1}{2}$ inches, $\frac{1}{4}$
inch Rotor Shafts.

As illustrated

"B" .0008 M.F. \$5.00
"C" .0017 M.F. \$6.00



Counter Balanced
TYPE C

Vernier TYPE B Type "B" COUNTER BALANCED

and with
VERNIER ADJUSTMENT

13 Statots, 12 Rotors and 1 Extra Heavy
ROTOR VERNIER of Special Alumi-
num.

FORMICA Inserts & Nickel Plated Ter-
minal Posts. Diameter of Aluminum
End Castings $3\frac{1}{8}$ ".

$\frac{1}{4}$ " Rotor Shaft, $\frac{1}{2}$ " Vernier Shaft with
8-32 thread.

Outside Dimensions between
the end Castings $3\frac{3}{8}$ ".

As illustrated

"B" .0008 M.F. \$6.50

Types 11, 23 & 43 VARIABLE CONDENSERS

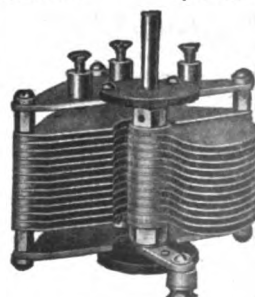
No. 11— 6 STATORS and 5 ROTORS
No. 23—12 STATORS and 11 ROTORS

No. 43—22 STATORS and 21 ROTORS
Special Aluminum Plates

FORMICA Insulation and Nickel Plated
Terminal Posts. Outside Diameter 4
inches.

As illustrated

No. 11	No. 23	No. 43
.00047 M.F.	.00074 M.F.	.0015 M.F.
\$3.75	\$4.00	\$4.50



Variable
TYPE 23

Authorized Sales Representatives

Western Radio Distributing Co.,
114 L. C. Smith Bldg.,
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Detroit Electric
Company
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The Reynolds
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Sales Co.
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Trade Mark **BKUMA YRLSBUG** Reg. Ap. For
Attentive Beginners Who Use

Dodge One Dollar Radio Short Cut

DO ARRIVE

Items From Our Honor Roll

1BYB

Earle E. Lockwood, Norwalk, Conn.
9 Westport Ave.
Memorized Code in 40 Minutes

1BIC

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262 Summit St.
Memorized code in few hours

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Arthur J. Carlson, Waterbury, Conn.
Colonial Trust Co.
Memorized Code in One Hour

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Paul St. Jacques, Woonsocket, R. I.
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Some Learned Code, Passed Exam, Won License All in One Week. Fact Reported to Enlighten Others Struggling With ABC Methods. Send ONE DIME for Honor Roll Dodge Short-Cut Beginners Now Licensed Operators—Covers Ten Radio Districts.

FOR EACH DIME OUR METHOD COSTS IT MAY SAVE DOLLARS

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MAMARONECK, N. Y.

Vacuum Tube Detector \$5.50

Including complete cabinet with all instruments wired ready for use.

DETECTOR AND TWO STAGE AMPLIFIER

\$22.50

With transformers and all other instruments in cabinet, ready for operation. This equipment is of high quality and distances of as high as 3000 miles have been obtained with ease.

BATTERIES AND TUBES

EXTRA

2000 Ohm receivers \$5.00
SUPERIOR CRYSTAL
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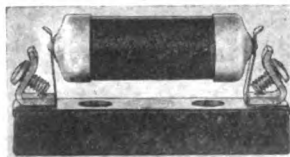
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BUILD YOUR OWN. 50c instruction book for 20c on how to make eight classes receiving sets from two slide tuner to combined radio—audio frequency outfits. With every order you receive price list of parts illustrated in book. Buy direct from factory and save dollars. Both text book and catalog mailed for 20c.

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Ring Book Containing 50 Conventional Log Sheets and 50 Radiogram Blanks—Re-Fillers Very Reasonable.

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Continuously since 1909 Duck's Radio Catalogs have never been equaled for completeness, and great wealth of radio data

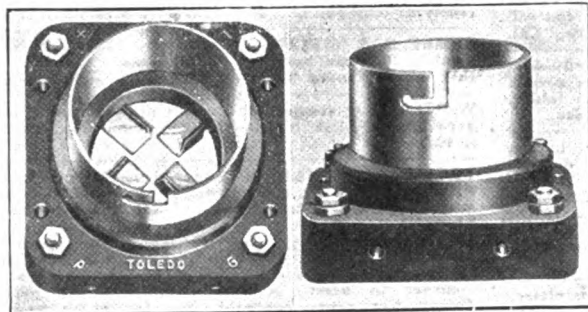
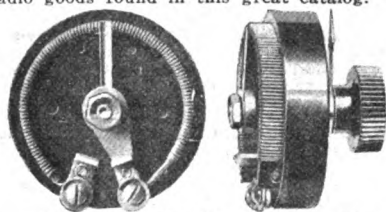


Send 25c in coin carefully wrapped for your copy of this wonderful book, the most unusual and complete catalog ever put between two covers. Not sent otherwise. Enormous cost and tremendous demand prevent distribution at a less retainer.

Never in the history of radio has there been such a catalog. The radio data and diagrams embracing upward of 50 pages give the experimenter more valuable and up-to-date information than will be found in many textbooks selling for \$2; and \$1 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth-while radio goods found in this great catalog.

Over 50 pages of latest hook-ups (wiring diagrams) and invaluable and up-to-date data and information on radio. Not only a catalog, but a wonderful textbook on radio.

Our new No. A650 Duck Rheostat (at right) has just the necessary amount of resistance to take care of the drop in voltage from the battery when fully charged to the battery at its minimum working voltage. The base is of moulded composition. The resistance element is wound on a black fibre strip, the element being securely fastened in a slot in the base. Contact arm is of phosphor bronze of the proper tension to insure perfect contact and smooth operation. Adjustable to any thickness panel up to $\frac{3}{8}$ inch, 2 $\frac{1}{4}$ inches in diameter. An exceptional Rheostat at a most popular price. No A650 Duck Rheostat, \$1. Shipping weight 8 oz.



No. A666 Duck's Positive Contact Bakelite Tube Socket (at left) is beyond doubt the most advanced tube socket on the market today. To our knowledge there is no other type of tube socket that cannot be forcibly criticized from some angle. Either the receptacle does not easily accommodate the varying diameter of the bases of bulbs, or the notch on receptacle is not just right, or the receptacle is easily subjected to breakage, or connections are in an inconvenient place, or, and

most important of all, the type and style of the contacts do not insure positive, certain contact without considerable manipulation.

In our new socket all these defects in other bulbs are overcome.

No. A666 DUCK'S Bakelite Tube Socket, \$1. Shipping weight, $\frac{1}{2}$ pound.

DUCK'S New Moulded Variometer

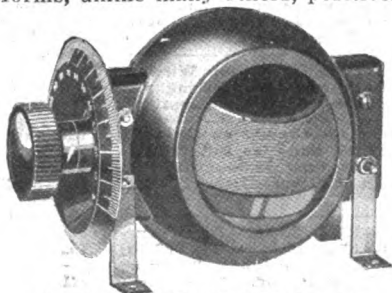
Our new moulded variometer (shown below) speaks for itself. For a comprehensive description of the design and radio thought back of our variometers, we invite your attention to our exhaustive description in catalog. In prettiness of design, compactness and lightness of weight, we have not seen any variometer that we believe compares with ours. The forms, unlike many others, positively will not warp.

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Stood the Test of
Time
1909-1922**

There are many Duck products that completely dominate all competitive types.

**The Largest Line in
America — 62 Complete
Instruments—58 parts.
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We want live, responsible dealers in every city and town in the United States, both for the sale of our extensive line of radio apparatus and all other worth-while lines of radio goods, on all of which we can quote attractive dealer's discounts. We can offer you facilities and advantages that no other radio house can offer.



Duck's New Moulded Variometer

No. A900 plate variometer, with knob and dial, \$7.25

No. A901 grid variometer, with knob and dial, \$7.25

Note: If knob and dial are not desired deduct 75c.

The WILLIAM B. DUCK CO., 243-245 Superior Street, Toledo, Ohio

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Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 10th of month for succeeding month's issue.

WEST COAST signals all over the room with 4GL radio frequency transformers. Range 200-600. Price \$3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

WANTED 200 Watt Acme Power Trans. Have almost new 1/8 h.p., 220 volt motor; 1800 R.P.M.—\$18.00. Will swap. B. Ainsworth, 561 Grand St., B'klyn, N. Y.

USED RADIO and electrical books and correspondence courses bought, sold and exchanged. List free, Roy Anderson, Ketchikan, Alaska.

PRACTICALLY GIVEN AWAY new Magnavox \$40.00, short wave regenerative and two step amp. phones, B Batteries, tubes, 6V 80 Cooper Battery \$75.00. Bakelite enclosed gap with motor \$14.00. Murdock Variables \$3.00, Bauernfeind & Heid Co., Menasha, Wis.

STANDARD RADIO parts, 10% to 20% off list price. Tubes, headsets, condensers, couplers, in fact, practically everything in radio. Write for prices on any equipment desired. Buyright Co., P. O. Box No. 82 (Benson Station) Omaha, Nebr.

REGENERATIVE SETS below cost, variometers, vario-coupler, detector, two stage amplifier, jack control, complete, \$45.00, Caverley, 4744 Winthrop Ave., Chi.

RADIO STORAGE BATTERIES, 2v-60a, \$6.50; 6v-40a, \$11.00; 6v-60a, \$13.00; 6v-80a, \$15.00. Mail orders filled on receipt of price. Send Stamp for folder, Lloyd E. Clark, 383 Broadway, Everett 49, Mass.

FOR SALE Regenerative Receiver with detector in 9"x14"x10" mahogany cabinet. Have heard every district with it. Includes 6 volt Exida battery and .001 condenser free. Sell for \$50.00. 1/4 K.W. Acme Transformer, Murdock Oscillation Transformer, Plate Glass Oil Condenser, Rotary Gap and Eldredge Ammeter, sell for \$25.00 or trade for CW apparatus, Wayman Davenport, Plainview, Texas.

FOR SALE Complete, twenty watt C.W. Transmitter, panel mounted, formerly 8PN Deceased. Write for list, W. W. Espey, Vandergrift, Pa.

FREE Vacuum tube socket given free with each Radiotron detector tube at \$5.00 or Amplifier tube at \$6.50. We have a complete line of standard apparatus at standard prices for immediate shipment. Twelve-hour service or money refunded. Florman Radio Laboratory, McPherson, Kansas.

FOR SALE 19 panel DeForest receiving set with 17 honeycomb coils but without bulbs or receivers or battery. First M.O. for \$100.00 takes it. J. P. Gillett, Rippey, Iowa, RDO 9BGH.

FEW GENUINE GERMAN TELEFUNKEN H. W. AMMETERS with scale reading 0-4 amps. Fitted with shunt for half scale reading and adjustment for temperature variations. Very accurate and sensitive. Brand new with original seals unbroken. Diameter 2 and 7/8 inches. While they last, \$3.50 each. Robert E. Goll, 1342 East 22nd St., Brooklyn, N. Y.

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SELL: Reinartz Tuner and detector control, \$25.00. Write Harold Heiss, 9506 Columbia Ave., Cleveland, Ohio. 8CYZ.

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SELL: 1/4 K.W. Blitzen Transformer \$10.00; 1/4 moulded condenser \$4.00; Proudfoot Det. & 2 stage \$20.00. F. B. Hoselton, Webb City, Mo.

A REAL radio frequency transformer for amateur use; beats anything on the market; range 200-600 meters; designed by 4GL; price \$3.15 each postpaid anywhere in U. S. Circuit with each transformer. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

FOR SALE: 2000 Mile Spark Transmitter, \$40 Complete. Will sell parts. Radio 60M.

TELEFUNKEN 1/4 KW 500 cycle ship set complete with motor generator, receiving set, spare parts. New \$250. An International four cylinder gasoline power unit AC or DC cost Navy \$100.00 With above set \$100 extra. Telefunken or Crocker Wheeler 500 cycle motor generators for tube sets, \$75.00. Henry Kienle, 601 E. 84th St., New York.

1 K.W. Thordarson \$15, Hyrad Disc \$5, Special Rotary Quenched Gap \$20, Lightning Switch \$3. R. Kinney, 1808 Middlehurst Rd., Cleveland Heights, Ohio.

WANTED: Used 500 Watt 1000 Volt D. C. generator, state full particulars, price reasonable. Sell spark and receiving equipment. Roy Kuester, Menasha, Wis.

GREBE C. R. 8 \$72.00 Antenna wire, 7 strand No. 22 tinned, 70c. per hundred ft., Magnavox \$40.00. Sale this month, write Mack's Radio Shop, Ansonia, Conn.

WANT to buy second-hand receiving set—describe and give price. A. A. McTavish, McKinney, Tex., care Dr. Gould.

TWIN S. CRYSTALS, the Super Sensitive crystal sold with a money back guarantee. Pair 25c. 500 mile regenerative plan free. Nelson Mfg. Co., Interurban Bldg., Dallas, Texas.

TESTED GALENA CRYSTALS From our own Mines shaped and tested at the mine in best standard hookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for \$1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

TRADE: Factory-mounted 2 K.W. Packard, like new, guaranteed. Want 1 K.W. Clapp-Eastham Transformer, Tesla Coil, Brown Phones or equipment equal value. All letters answered. H. Oge, Box 32, Boonville, Ind.

FOR SALE—Variometer set, 2 step, batteries, tubes. Excellent condition \$150. Small single circuit set \$50. Loud talker, \$15. 8BIP, Syracuse, N. Y.

FOR SALE—1/4 K.W. 27000 volt transformer, Clapp-Eastham coffin type, \$20.00. Herschel Powell, Romeo, Mich.

HOOK-UPS: Diagram of connections for detector and two-step amplifier to work with Reinartz tuner, for silver dime. John L. Reinartz, South Manchester, Conn.

SPECIAL—1/4 KW spark transmitter panel, mounted, \$20.00. Durant Rice, 1321 So. 35 Ave., Omaha, Neb.

—CW MUST SELL—DeForest OT3, 3 Radiotrons; UV 202; Federal Hand Microphone; worth \$130 for \$55.00. Esco DC motor generator 500 volt, 8U, Field Rhostat, worth \$110 for \$50, meters, filters, etc., Rhodes, 40 West 86th St., N. Y. C.

BATTERY CHARGERS: Best and cheapest battery charger on market \$15, new demonstrators \$13.75, absolutely guaranteed. Complete with ammeter, clips and cord. Oscar Ruf, 1480 Santa Clara St., Santa Clara, Calif.

4GL RADIO frequency transformers; DX, fones and 600 meters; \$3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

2KF's—PARAGON 2-5-U—Transmitter, used six months. You know the brand and quality. Price \$35. H. D. Selvaie, Irvington, N. J.

HONEYCOMB Coil Regenerative, including Coils and Radiotron Detector \$50.00. Box 205, Williamsport, Pa.

HERE'S A BARGAIN: Complete station (formerly 9UC) will be sold. Write for list. Everything must go and it's priced to sell. L. M. Smith, Salem, Wisc.

MAKE YOUR OWN Head Phones. Complete parts including Headband, Cases, Magnets, coils completely wound 2000 ohms, all ready for assembling with instructions \$3.50. South Hills Radio Co., 411 Charles St., Knoxville, Pittsburgh, Pa.

600 WATT, 1000 Volt Generator, speed 1750, \$60; 6 Volt, 40 Amp. Battery, \$5.00. Philip Stout, Knoxville, Tenn.

FOR SALE— $\frac{1}{2}$ KW spark transmitter complete, \$35. Will trade for receiving apparatus. A. G. Strauss, 525 N. 9th St., La Crosse, Wis.

AMRAD 6 volt spark coil, \$10.00. Gall Wade, Manitowoc, Wis.

MOTION PICTURE machine, complete with arc light, rheostat, film rewinder, etc., ready for use. Cost \$200. Sell for \$45 or trade for good 500 volt motor generator, 8CFB. H. E. Wallace, 7215 Whipple St., Swissvale, Pa.

CW TRANSFORMER for sale—For 5 watt tubes, 900V. secondary with midtap, 7.5 filament with midtap at 35v, 7.5v Kenotron filament 7.5v midtap 3.5v. Primary to operate on 110v, 60-cycle. Will operate 4-UV-202. Price \$20.00. Arthur L. Walser, Chesaning, Mich.

SELL:—3000 Meter Loose Coupler, \$5.50; genuine two filament Audiotron, \$4.50; Cunningham Amplifier, \$3.00. Hayden Whitney, Jr., Concord, Mass.

INVENTORS: Protect your invention through A. M. Wilson, Inc., Washington, D. C. Over 20 years of efficient, expert, confidential service. Skilled in Radio-Electrical, Chemical, and Mechanical fields. Our 1922 illustrated Booklet, giving much necessary and very useful information which every inventor should know, will be sent free upon request. Prompt and careful attention. Highest references. Moderate fees. Send sketch or model for our careful opinion and preliminary advice. Write today to A. M. Wilson, Inc., (Radio 3ARH) 310-16 Victor Building, Washington, D. C. (Successor to business established in 1891 by A. M. Wilson).

FOR SALE—1 BDC's CW, ICW and fone set consisting of two 50 watt tubes, motor gen., instruments, etc., \$175.00, all inquiries answered. Wm. E. Arnold, 183 Oliver St., Southbridge, Mass.

MUST SELL $\frac{1}{2}$ KW Thordarson transformer, \$15.00; OT for same, \$5.00; .007 mf. glass plate condenser, \$6.00; one step amplifier, \$12.00; Regenerative receiver without bulb or battery, \$35.00. Raymond Winslow, 31 Paris St., Norway, Ma.

FOR SALE—New Magnavox R-3, \$40.00. Henry C. Winte, Chesaning, Mich.

GENERATOR WANTED, 50—100 watts, 500 volts, R. Young, 3 Glebe Rd., Toronto, Canada.

SELL—Regen. & Det. 2 step, \$55.00, complete $\frac{1}{4}$ KW transmitter, 55 fons, \$3.50. Albert Woodruff, Glenwood, Ia.

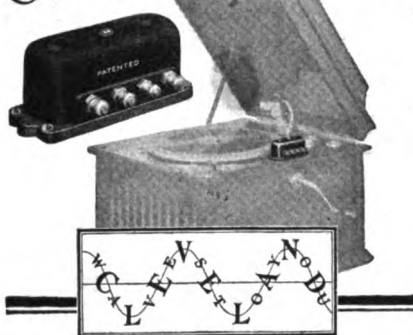
BARGAIN— $\frac{1}{2}$ KW spark set with motor rheostat, \$25. E. Squires, Wheaton, Ill.

FOR SALE—Regenerative Tuner, detector and three stage amplifier with two large Burgess "B's". All O.K. Details upon request. Price without tubes, \$90. Detector and 3 Western Electric Amplifier Tubes (not Signal Corps), \$125. Edgar Bell, 55 Harwood St., Pittsburgh, Pa.

OUR SPECIALS THIS MONTH: Forty-three plate variable \$2.50, Variocouplers wound with green Double Silk wire, \$3.75; Pennsylvania Storage Batteries, 6 volt, 80 amp., \$13.00. Eighteen months' guarantee. Only 100 to go at this price. Penna. Grove Radio School, Broad Theatre Bldg., Sales Department, Penna. Grove, N. J.

POST CARDS—Description of ur station with QRA. 500, \$3.50; 250, \$2.50, delivered. Samples on request. Donald J. Detwiler, 1120 Va. Ave., S. W. Washington, D. C.

Cleveland Dulce-Tone Junior.



RADIO MUSIC PERFECTLY REPRODUCED THROUGH YOUR PHONOGRAPH

The Dulce-Tone Junior converts your phonograph into the finest of loud talkers without detracting in the least from its power to play phonograph records.

The radio music comes to you with cello-like sweetness, even more clearly than that reproduced from your records.

The Dulce-Tone Junior is adaptable to any phonographic instrument. When you consider that you are using the wonderful sound-box, tone-arm and even the needle which has been perfected only after years of experimenting, you can realize the **QUALITY** and **SWEETNESS** of the tone which is so faithfully reproduced through the Dulce-Tone Junior.

Any one can attach the Dulce-Tone Junior in a few minutes. To operate, simply swing the tone arm allowing the needle to rest on the small center element of the Dulce-Tone Junior. This ingenious instrument eliminates the necessity of numerous expensive head-phones when entertaining a roomfull of people—is a true economy.

The Dulce-Tone Junior is the instrument of the century—an instrument that will improve any radio set. Put one on your phonograph today and realize the possibilities of radio music for quality of tone.

RETAIL PRICE..... ONLY \$15.00
(\$17.50 West of the Rockies)

If your dealer does not handle the Dulce-Tone Junior, fill out the coupon below, mail it with one dollar and we will forward this wonder instrument to you C.O.D. at \$14.00.

The Cleveland Radio Mfg. Co

241 St. Claire Ave., N. E. Cleveland, Ohio
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COUPON

The Cleveland Radio Mfg. Co.,
241 St. Claire Ave., N. E.,
Cleveland, Ohio.

Enclosed find one dollar for which send me a Dulce-Tone Junior (\$14.00 balance due C.O.D.) Send me your folder entitled "Waves to You Through Your Phonograph."

Name

Address

Town & State



Red Seal Battery Contest

Starts Nov. 1st Closes Nov. 15th



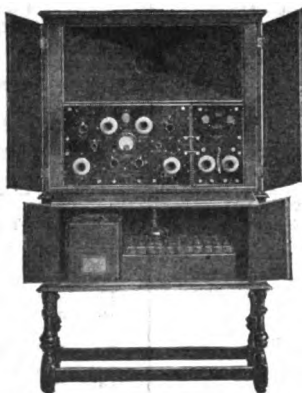
ALL RADIO SETS INSTALLED FREE IN THE HOMES
OF THE WINNERS ANYWHERE IN THE U. S. A.

1st Prize

This cabinet type complete Radio Receiving Set is one of the finest and most up-to-date sets on the market. It is designed and manufactured by the Colin B. Kennedy Company of San Francisco and St. Louis, makers of the finest type of radio receiving sets. The cabinet is walnut and stands 58 inches high—a masterpiece of cabinet making. The receiving set is regenerative, having an effective range from 175 to 25,000 meters—400 to 600 miles on "broadcasting." Contained within the cabinet are all batteries, Magnavox Loud Speaker with special horn, a Radio Homcharger De Luxe. Value complete, \$725.00.

2nd Prize

It consists of the Westinghouse R. C. Receiving Set, Western Electric Loud Speaker, "Tungar" Battery Charger, Storage Battery, 9 "B" Batteries, one Manhattan 3,000 ohm Headset, 3 vacuum tubes, 2 telephone plugs, and complete antenna equipment—a total value of \$408.50.



3rd Prize

A complete receiving outfit made up of the well known Grebe CR-9 Regenerative Receiver with 2 stage amplifier, Magnavox Loud Speaker, Storage Battery, a Radio Homcharger De Luxe, "B" Batteries, one Manhattan 2,000 ohm Headset, 8 vacuum tubes, 2 telephone plugs, and complete antenna equipment—a total value of \$256.50.

50 Other Prizes

To 50 other contestants, whose answers the judges decide are most meritorious, will be given one of the famous Manhattan 2,000 ohm Radio Headsets. These headsets are built with the precision of a watch and have great sensitiveness and high amplifying qualities.

Win this \$725.00 Radio Set FREE

*Only a rich man could buy it
but a poor man may win it FREE*

SIMPLY obtain a free "Red Seal Battery" contest blank between November 1st and November 15th from stores that show the Window Display pictured below. Each contest blank gives full simple instructions to help you write your answer and full rules of the Contest.

Red Seal Battery, Finish-the-Sentence Contest

The prizes will be awarded for the most appropriate answers for completing in your own way in not more than ten words, the following sentence:

"The Red Seal Dry Battery is best
(1) because it is the all-purpose battery and (2) because....."

Examples

Your answer may be descriptive of the Red Seal Dry Battery or it may describe some use. For example: "It never fails on land, air or sea." Another: "It never starts what it can't finish." Another: "It rings bells and buzzes buzzers."

Judges

The judges of the Contest are: Mr. Llew Soule, Editor of *Hardware Age*, New York; Mr. Howard A. Lewis, Manager of *Electrical Merchandising*,

New York, and Mr. Joseph A. Richards, President, Joseph Richards Co., Inc., Advertising Agents, New York

Awarding the Prizes

Prizes will be awarded to those who conform to the rules of the Contest and whose answers, in the opinion of the judges, are most appropriate. In case two or more persons submit winning answers, prizes identical in character with those offered will be given to each successful contestant.

Announcing the Winners

As soon as possible after the judges have rendered their decision the names of the prize winning contestants will be announced in the *Saturday Evening Post*.

**Contest Opens Nov. 1--Closes
Midnight Nov. 15.**

All answers must be written only on contest blanks supplied by dealers displaying Red Seal Battery Contest window display. Send as many answers as you like to:

Red Seal Battery Contest

Manhattan Electrical Supply Co., Inc.
17 PARK PLACE
NEW YORK CITY, N. Y.



Look for this Window Display in Dealers' Windows Nov. 1 to 15. It identifies Dealers who will give you free Contest Entry Blanks.



MANHATTAN
ELECTRICAL SUPPLY CO., INC. NEW YORK
Makers of the Famous Red Seal Dry Batteries
and Manhattan Head Sets



—FOR YOUR CONVENIENCE—

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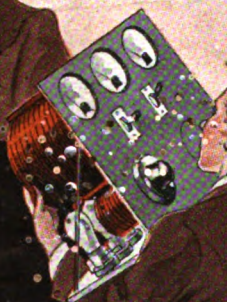
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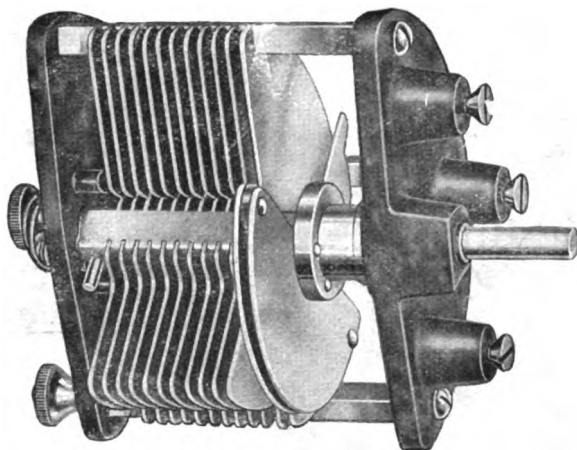


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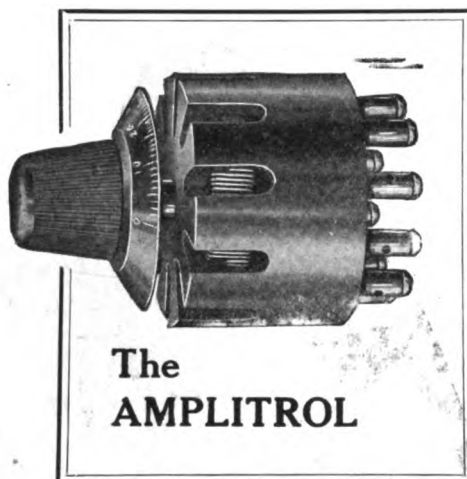
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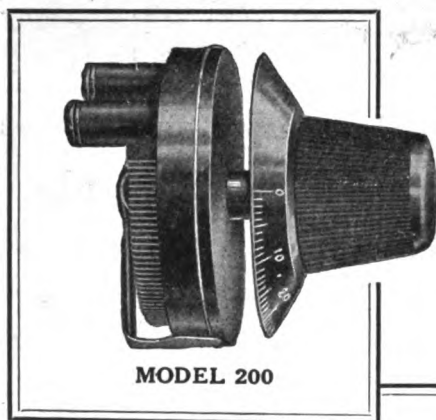
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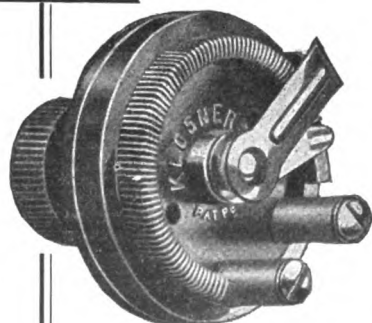
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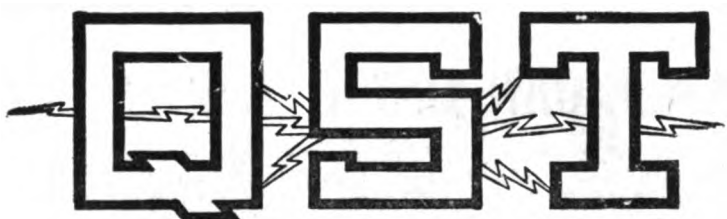
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The Official Organ of the A.R.R.L.

VOLUME VI

NOVEMBER, 1922

No. 4

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The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radiotelegraphic communication.

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A Magazine Devoted Exclusively to the Radio Amateur

The Wave Antenna for 200-Meter Reception

By H. H. Beverage

Engineer, Radio Corporation of America

For a year now QST has been endeavoring to secure reliable information on the so-called Beverage Wire or wave antenna, which for special purposes is the best arrangement known today. With the approach of our Transatlantic Tests the matter became of even greater moment and we appealed to the Engineering Department of the Radio Corporation of America. They had never done any practical work with it on amateur wave-lengths but very courteously arranged for a series of special tests at their Belmar station, where engineers were sent and numerous lengthy tests conducted on this special subject. The following article, written especially for the A.R.R.L. and QST, is the result. It is absolutely a classic in the literature of amateur radio, and we are very proud of it. We acknowledge our gratitude to the Radio Corporation and its engineers for their very kind co-operation.

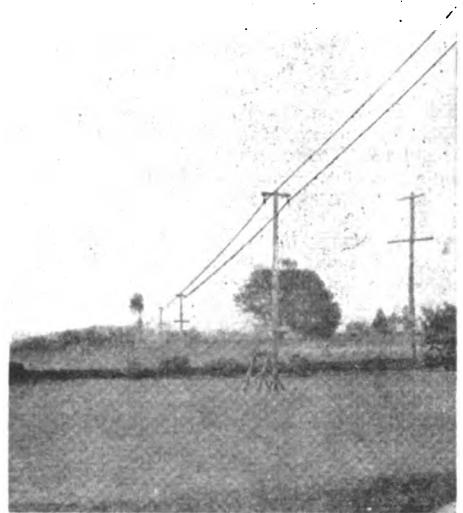
No license rights are to be inferred from the publication of this article, but attention is called to the fact that amateurs are given the privilege of using the wave antenna as set forth and to the extent indicated in the current catalogue of the R.C.A., the owner of the license rights.—Editor.

THE Wave Antenna is a new type of unidirectional antenna which has been developed by the author and Messrs. Chester Rice and E. W. Kellogg of the General Electric Co., and is covered by patents and applications. This antenna has been in existence for some time, but was first brought to the attention of the amateurs by Mr. Paul F. Godley, who described it in his report on the reception of American amateurs at Ardrossan, Scotland. The full theory of this antenna is scheduled to appear in an A.I.E.E. paper for the Pittsburgh convention in November, so this paper will be confined to very elementary theory and practical considerations.

Theory

If a wire is suspended in space, it has a certain capacity and inductance per unit length which bear a definite relation to each other. This relation may be expressed as $1/\sqrt{LC} = V$, where V is a constant. This constant is the velocity of light. For example, if L and C are expressed as the capacity and inductance per meter, then $V = 3 \times 10^8$ meters, which is the velocity of light in meters per second. If a larger wire is used, or if two or more wires are used instead of one, in the ideal case the inductance decreases in the same ratio as the capacity increases, so that $L \times C$ is always a constant. This means that, for the ideal wire, the currents induced in that wire will always travel along it at the velocity of light, independent of the size or number of wires.

A practically-constructed wire must be supported at several points and must run



One of the "Beverage Wires" erected at Belmar for these tests.

horizontally within a few feet of the earth. The effect of the supporting insulators and the proximity of the earth is to

increase the capacity in a greater ratio than the inductance decreases, so the velocity of the currents on a practical wire is always somewhat less than the velocity of light. On short wave-lengths, however, the velocity approaches very close to the velocity of light, generally between the limits of 85% and 98% of the velocity of light for 200 meters, depending upon the size and number of wires.

In order to make the antenna unidirectional, it is necessary to stop the reflections at the end farthest from the receiver end. This is accomplished very simply by placing a non-inductive resistance between the antenna and ground at the far end. If this resistance is made equal to the "Surge Impedance" of the wire, it absorbs all of the energy and prevents any of it from being reflected back to

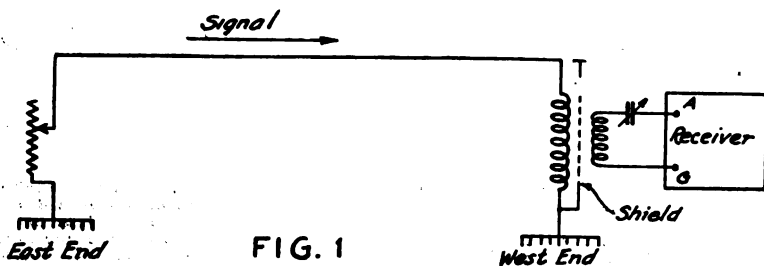


FIG. 1

In Figure 1 is shown the simplest form of Wave Antenna. It consists simply of a wire, at least one wave-length long, stretched in the direction of the transmitting station. For explanation purposes, it may be assumed that the transmitting station is east of the receiving station, and that the receiver is placed at the west end of the antenna, as shown. The travelling wave from the transmitting station moves from east towards the west at the velocity of light. As the wave moves along the antenna, it induces currents in the wire which travel in both directions. The current which travels east moves against the motion of the wave and builds down to practically zero if the antenna is one wave-length long. The currents which travel west, however, travel along the wire with practically the velocity of light, and, therefore, move along with the wave in space. The current increments all add up in phase at the west end, producing a strong signal, as shown by curve A in Figure 2. In like manner, static or interference originating in the west will build up to a maximum at the east end of the antenna, as shown by curve B in Figure 2.

If the east end of the antenna were open or grounded through zero resistance, all of the energy represented by curve B would be reflected and would travel back over the antenna to the west end, where part of the energy would pass to earth through the receiver and part would be reflected again, depending upon the impedance of the receiver winding. The horizontal plane intensity diagram would be bi-directional, as shown in Figure 3. The reception from the west is not as good as from the east because some of the energy is lost due to attenuation in the wire as the reflected wave travels back from east to west.

the receiver. The intensity characteristic becomes unidirectional, as shown in Figure 4.

The value of the surge impedance depends upon the size, number, and height of the wires above ground, but is independent of the length of the wire. For practical construction with one or two No. 12 copper wires, the surge impedance lies between the values of 200 and 400 ohms. The surge impedance is theoretically equal to $R = \sqrt{L/C}$, where L and C are the inductance and capacity per unit length.

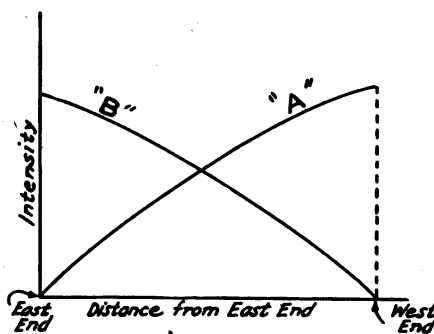


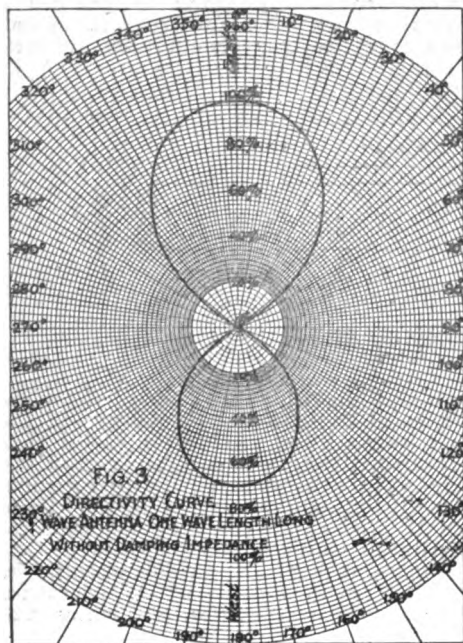
FIG. 2

Godley used the simple form of wave antenna, as shown in Figure 1. However, this is not the most practical form as it is necessary to go to the far end to make adjustments of the damping resistance.

Feed-Back Antennae

If two parallel wires are used, the wave antenna becomes very flexible and the receiver may be placed at either end with local control of the damping. In Figure 5, for reception from the east, the receiver

at the west end is replaced by the primary P of a transformer T_2 . The primary is coupled to the secondary S as closely as possible, and feeds the energy over the two wires as a transmission line. A second transformer T_1 at the east end feeds the energy from the transmission line into the receiving set. The energy fed over the transmission line circulates around the line

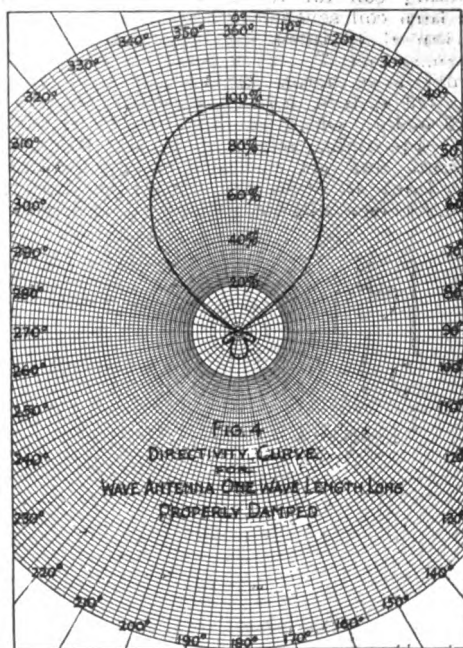


as in an ordinary metallic-circuit telephone line, and, therefore, the currents pass through both halves of the primary of T_1 in the same direction, inducing voltages in the secondary which feeds into the receiving set. On the other hand, currents coming over the wires as an antenna, that is, from the west, are equal and in phase on both wires, and upon passing to ground through the two halves of the primary of the output transformer T_2 , they pass through the winding in opposite directions and neutralize. With this circuit, the energy reaching the receiver is the same as it would be if the receiver were placed at the west end, excepting for the transmission line losses, which ordinarily are 20 to 25% with proper design. With this feed-back system, the operator can make adjustments of the surge resistance without leaving the station, and can listen to the signals while he is making the adjustments.

Figure 6 is equivalent electrically to Figure 5, but in this case the transformer T_1 has been replaced by a simpler circuit. By grounding one wire and leaving the other wire open, the energy is reflected on

each wire, but the reflected currents on the transmission line are 180 degrees out of phase on the two wires, and, therefore, a difference of potential exists across the terminals of the primary of transformer T_2 , exactly the same as when the reflection transformer T_1 of Figure 5 was used. If the ground resistance at the reflecting end is zero, the reflection of energy with the connections of Figure 6 would be 100% efficient, and the only loss would be the transmission line losses. The open-ground reflection connection is preferable to a transformer, on short wave-lengths particularly.

It is possible to damp a two-wire antenna from either end. In the case of Figure 6, the signal from the east built up to a maximum at the west end, and was then reflected up to the east end, where the receiver and damping circuit were placed. In the case shown in Figure 7, the receiver is placed at the west end as in the case of the simple antenna of Figure 1. Instead of placing the damping circuit at the east end, however, it is placed across the transmission line at the west end where the receiver is. This damping circuit is practical-



ly just as effective as it would be if actually placed at the far end. This circuit also has the advantage that the desired signals do not pass over the transmission line, and the transmission line losses are avoided.

In order for the damping circuit to be effective, it is necessary that the two wires of the antenna be joined through an in-

ductance which is of high impedance compared with the impedance of the damping circuit. The best way to accomplish this result is to use a coil with a mid-point tap, as shown at *N* in Figure 7. With respect to the transmission line, the two halves of this coil are adding, so the inductance across the line is high. With respect to the receiver, however, the two halves of the coil are opposing, so that the impedance in series with the output transformer amounts only to the leakage reactance of the coil *N*, which can be made very small. A satis-

elimate. This is made possible by making the damping-circuit reactance, either slightly capacitive or slightly inductive, instead of purely resistive. In some cases it may be desirable to reflect a small amount of energy to neutralize undesirable signals from the back end. This is readily accomplished by adjusting the resistance and capacity of the damping circuit. The capacity and inductance in this damping circuit are usually found to practically neutralize each other for the best adjustment; that is, they should tune approxi-

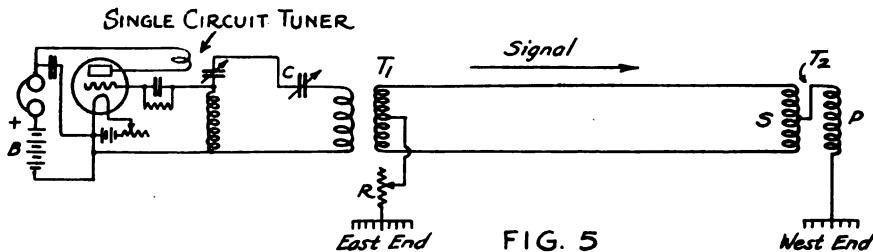


FIG. 5

factory coil for *N* for 200 meters was a 24-turn coil seven inches in diameter, with a tap at 12 turns for feeding the output transformer *T*. This coil was about 0.3 millihenries across the line, or 1900 ohms at 300 meters, and nearly 3000 ohms at 200 meters, which was high enough to have no appreciable influence on the damping circuit, and yet had low enough leakage reactance to allow the signals to pass to the receiver without noticeable weakening.

mately throughout the band of wavelengths it is desired to receive. If the wave-length being received is varied over wide limits, it is necessary to readjust the damping circuit condenser for best results, although the adjustment is usually quite broad. The resistance does not need re-adjustment except in special cases.

For a range of 180 to 360 meters, the damping circuit consists of an inductance of about 0.08 millihenries, a variable con-

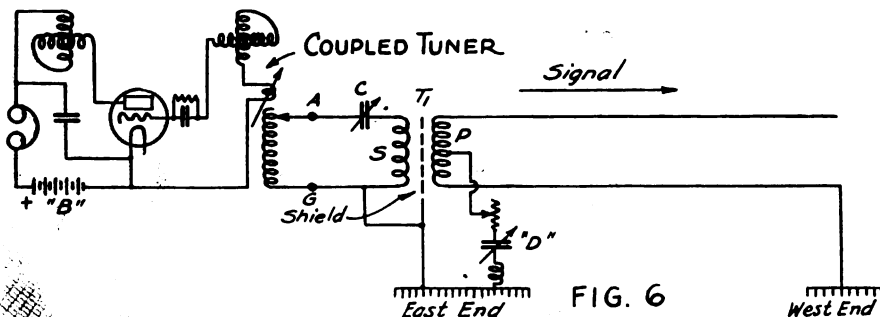


FIG. 6

Damping Circuits

In Figures 6 and 7, damping circuits "D" are shown which consist of resistance, inductance, and capacity, in series. Due to distortion on the antenna, to back-wave effects, to interfering signals or static coming from such a direction as to be received on one of the little "ears" on the back of the antenna, as shown in Figure 4, etc., it often happens that there are appreciable residuals which it is desirable to

eliminate. This is made possible by making the damping-circuit reactance, either slightly capacitive or slightly inductive, instead of purely resistive. In some cases it may be desirable to reflect a small amount of energy to neutralize undesirable signals from the back end. This is readily accomplished by adjusting the resistance and capacity of the damping circuit. The capacity and inductance in this damping circuit are usually found to practically neutralize each other for the best adjustment; that is, they should tune approxi-

ance of the potentiometer is taken into account when calculating the value of inductance to be used in series with the resistance and capacity. In this manner the inductance of the potentiometer used for the variable resistance may be tuned out, and the damping circuit may be made pure resistance for any one particular wave-length.

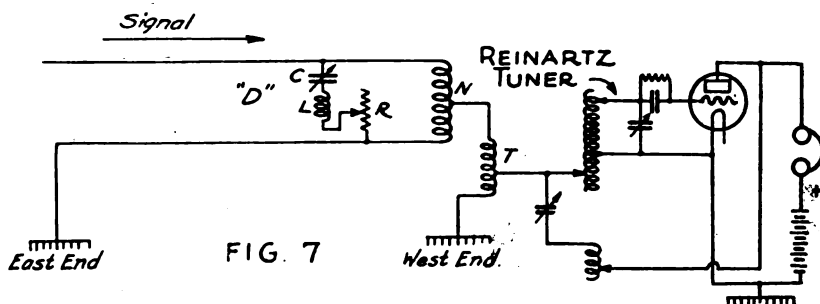


FIG. 7

When the damping circuit is placed across the transmission line as shown in Figure 7, the value of the damping resistance may vary considerably with wave-length, becoming lower for short wave-lengths, due to the increase in attenuation at short wave-lengths partially damping the antenna. In other words, the transmission line acts as a resistance in series with the damping circuit, and the transmission line resistance becomes appreciable at short wave-lengths.

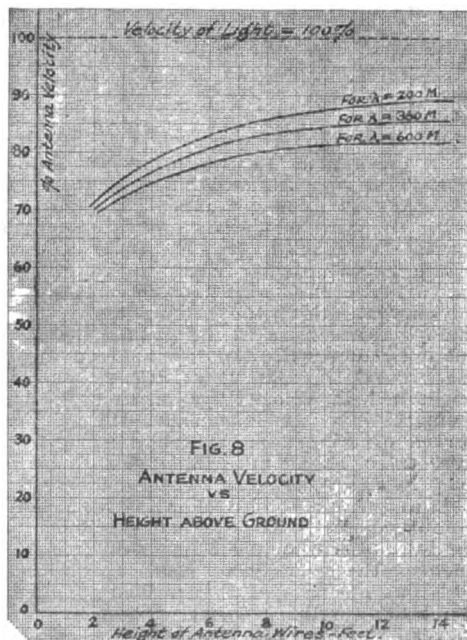
Antenna Design

It is obvious from the theory of the wave antenna just given that it must either point towards the desired signals or that it must point directly away from the desired signals. In case the antenna is pointed away from the signal, then the maximum signal occurs at the far end and must be brought up over the transmission line to the receiver, as shown in Figure 6. In case the antenna is pointed towards the signal, it is necessary to put the damping circuit on the transmission line, as shown in Figure 7. It is possible to use a single antenna for reception from either direction by switching arrangements to change to either the connection of Figure 6 or that of Figure 7 at will. It is preferable on short wave-lengths to point the antenna towards the signal, using the connections of Figure 7, but the feed-back of Figure 6 gives practically the same results, excepting that the signals are not quite as loud due to the transmission line losses.

It is necessary to run the wave antenna in as straight a line as possible and not nearer than 200 feet to other parallel wires, such as telephone and power wires, as the influence of these wires is liable to distort the directive characteristic of the antenna.

Other wire lines may be crossed at right angles without undesirable effects. In cases where it is not feasible to run the wave antenna in line with the desired signals, it is possible to get good reception with the antenna somewhat off line by sacrificing signal intensity. By referring to Figure 4 it is seen that for the average antenna one wave length long it is possible

to be 45 degrees off line before the signal drops to half intensity. Beyond 45 degrees the signal falls off very rapidly. Twenty degrees off line, the signal intensity has fallen off only 10%, so very good reception may be obtained. If the antenna is two



wave-lengths long, it is more directive, and it is not possible to receive well if it is more than 25 or 30 degrees off line.

The antennae are constructed of copper or other non-magnetic material, although

Mr. Cutler of 7IY reported in the October QST that he has obtained good results on a galvanized iron wire. The size of the wire is usually between No. 10 and No. 14 B.&S., although it is possible to get fair results even with No. 18 bell wire. The usual construction is to put up two wires

end is so far behind in phase that it not only does not add to the increments from points close to the receiver, but may actually subtract. The maximum length that it is feasible to use is that length at which the current in the wire lags 90 degrees behind the wave in space. This length is given by the formula:

$$L = \frac{\lambda}{4 \left(\frac{100}{C} - 1 \right)}$$

where

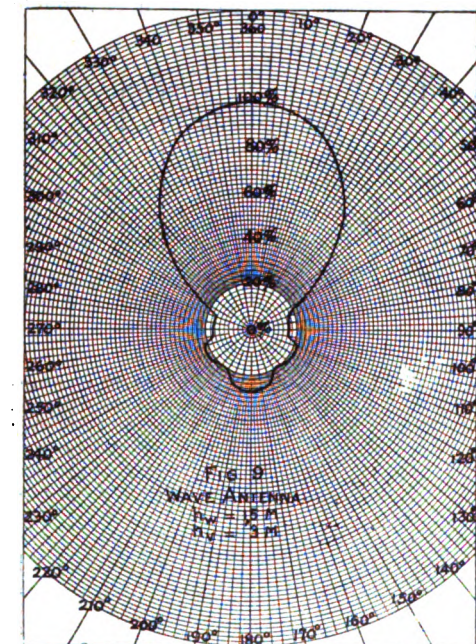
λ = wave-length in meters.

C = signal velocity on antenna expressed in per-cent velocity of light.

For example, from Figure 8 we find that the velocity of the currents in the two wires suspended at a height of 10 feet is about 88% of the velocity of light for 200 meters, so the maximum usable length is:

$$L = \frac{200}{4 \left(\frac{100}{88} - 1 \right)} = \frac{200}{.544} = 367 \text{ meters.}$$

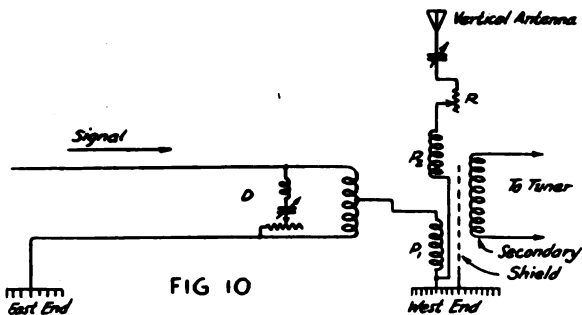
Therefore it is not feasible to use a two-wire antenna suspended at a height of 10 feet more than two wave-lengths long for 200 meters. By increasing the height, the velocity will increase, and longer wires may be used. Figure 8 shows that the velocity increases slowly with height above 10 feet, so the wires must be much higher to be of material advantage. Making the wires too high introduces a difficulty on short waves which does not occur on long waves, and that is the "end" or vertical-antenna effect. The effective height of a 200 meter wave antenna is about 5% to 10% of its horizontal length, depending upon the nature of the earth beneath the antenna, etc. If an antenna is 200 meters long, therefore, its effective height will be between 10 and 20 meters. If the antenna



on a cross arm about two to three feet long. The wires are suspended by porcelain cleats, or in more permanent construction standard telephone pins and high grade insulators are used.

The height of the wires above ground has a marked influence on the velocity of the currents along the wires when the wires are close to the ground, but if the wires are ten feet above the ground there is very little to be gained in velocity by making them higher, as shown in the curves of Figure 8. These data were taken on an antenna at Belmar, N. J., by Mr. H. O. Peterson. This antenna extended over fairly conducting soil. The character of the soil underneath the antenna influences the velocity to some extent, but the data of Figure 8 are about the average velocity. These curves show that the velocity becomes lower at longer wave-lengths.

If the velocity is too slow, then the currents in the wire lag in phase behind the wave in space, and a point is soon reached when the current in the wire from the far



is on supports 10 feet high, the vertical or end effect may be equivalent to an effective height of nearly 3 meters, distorting the directive curve. In Figure 9 is shown

the directive curve of a wave antenna of 15 meters effective height with a vertical or end effect of 3 meters superimposed upon it. It will be noted that the end effect may mount up to very serious proportions if the antenna is made too high. It is, however, possible to balance this end effect by means of a separate vertical antenna, as shown in Figure 10. P_1 is the standard primary, while P_2 is a second primary coil of about the same number of turns, which is wound over P_1 but in the opposite direction. How-

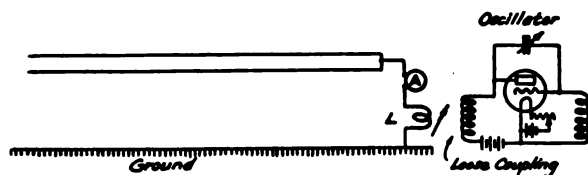


FIG 11

ever, in practice, the end effects seem to be very much smaller than predicted theoretically, so as a general rule if the antenna is not over 10 feet high the end effects are so small that it is not worth the trouble to balance them. From the above considerations, it is evident that 10 feet is a good average height for short wave antennae.

Design of Transformers

With the feed-back circuit of Figure 6 only one transformer is necessary. The output transformer T_1 was made up on a 7-inch cardboard tube. The primary P was 20 turns of No. 24 B.&S. D.C.C. copper wire, with a tap at ten turns or the exact center. Over the primary was placed a shield consisting of a piece of tinfoil insulated from both windings by paper. This shield was grounded to cut out capacity currents between primary and secondary. It is important that the tinfoil be not quite a complete turn around the primary; the ends must not touch or it will act as a short-circuited turn and introduces high losses. The secondary consisted of five turns of No. 18 bell wire wound over the tinfoil shield. The center of the secondary winding was lined up carefully over the center of the primary winding; otherwise the transformer would not be balanced. With the circuit of Figure 6, the transformer balance was tested by opening both wires at the west or reflection end. When the transformer T_1 was properly balanced, the receiver was quiet, indicating that the two halves of the primary were perfectly symmetrical with respect to the secondary.

Transformer T_1 of Figure 6 was designed to work with a coupled receiver. The secondary of the output transformer was connected in series with the primary of the receiver and was tuned by the series condenser C . This same transformer can also be used with a single-circuit tuner like

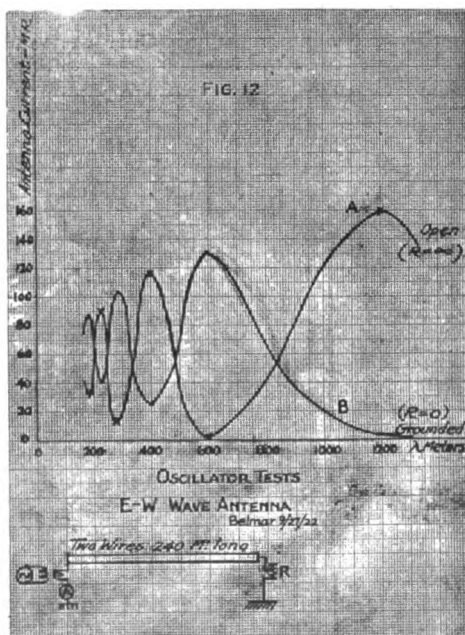
the Westinghouse RC or the General Electric AR-1300 tuner. For 200 meters, it is usually better to use a separate condenser C outside of the tuner condenser, as shown in Figure 5, but for longer wave-lengths this series condenser may be omitted.

When the circuit of Figure 7 was used, the transformer described above was used with success but better results were obtained by cutting the primary turns down to 15 turns instead of 20 turns. This transformer is shown in Figure 1, but may be used with the connections of Figure 7. A tinfoil shield is used between primary and secondary, and is grounded as shown. In all of these transformers the coupling between primary and secondary should be as close as possible.

In Figure 7 an auto-transformer T is shown. The total turns are 15, and the receiver is tapped off at 5 turns. The diameter of the turns is 7 inches, but smaller diameters have been used by increasing the number of turns to make the same inductance. This auto transformer connection has been adapted to a Reinartz tuner with excellent results by Mr. Bourne at 2BML.

Determination of Surge Resistance and Velocity

The velocity and surge resistance were easily determined by oscillator tests. An oscillator was coupled to the antenna, as



shown in Figure 11. In the antenna circuit was included a coupling coil L consisting of only two turns. The far end of the antenna was left open for the first test, and a resonance curve of the antenna was taken. The curve is plotted as Curve A in Figure 12. Then both wires of the antenna were grounded at the far end and the resonance curve taken again. This curve is plotted as Curve B in Figure 12. In order to find the velocity, it is necessary to calculate what the resonance points would be if the velocity of the currents on the wires was equal to the velocity of light.

The length of the antenna was carefully measured. In the case of this particular antenna at Belmar, the length was 240 meters. Assuming that the velocity of the currents on the antenna is equal to the velocity of light, the first resonance point with the far end of the antenna open will be the quarter-wave oscillation as in an ordinary antenna. The wave-length will be $4 \times 240 = 960$ meters. The next resonance point will be the three-quarter wave oscillation, or $4/3 \times 240 = 320$ meters. The next will be the $5/4$ oscillation, or $4/5 \times 240 = 192$ meters, etc., for all odd multiples of the quarter wave oscillation. In like manner, with the far end of the antenna grounded the antenna will oscillate at all even multiples of the quarter wave oscillation. These calculated values are recorded in the table below. In the next column, the observed values taken from Figure 12 are recorded. By dividing the calculated value by the observed value, we get the actual velocity at that particular wave-length in terms of per-cent of velocity of light.

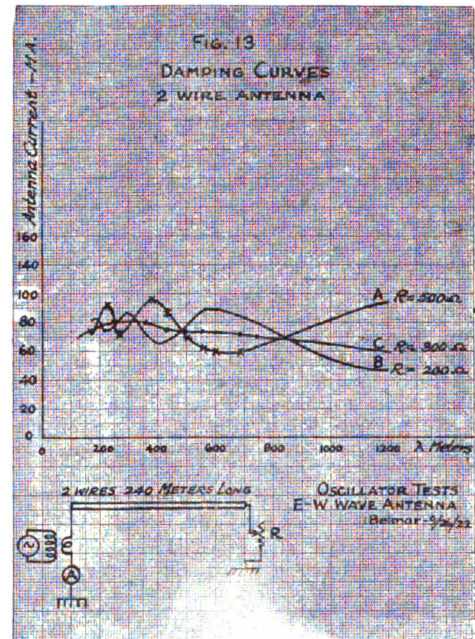
Calculation of Velocity of Currents on Antenna

Length = 240 meters, 2 No. 10 wires, 3 meters high.

Oscillation	Wave-length Calculated	Wave-length Observed	Velocity on Wires Velocity of Light
1/4	960	1200	80%
2/4	480	590	81%
3/4	320	390	82%
4/4	240	280	85%
5/4	192	220	87%
6/4	160	180	89%

To determine the surge resistance, a non-inductive resistance was placed between antenna and ground at the far end, and the resonance curve taken again. Figure 13 shows the results of this test on the Belmar antenna. Curve A, with 500 ohms at the far end, shows broad but unmistakable resonance points at open oscillation wave-lengths. On the other hand Curve B, with 200 ohms at the far end, shows grounded resonance points. Curve C, with 300 ohms at the far end, shows no resonance points, indicating that the antenna is quite aperiodic. Therefore the

surge resistance for this particular antenna is approximately 300 ohms. The downward bend of Curve C below 200 meters is not due to the antenna but is due to the oscillator output falling off when the coupling condenser approached zero.



When one of the wires was grounded at the far end and the other wire was left open, and the damping resistance was placed across the wires at the station end, as shown in Figure 7, a smooth curve, similar to Curve C of Figure 13, was obtained when the non-inductive resistance was 500 ohms. In this case, however, there were slight irregularities in the curve which do not appear in Curve C of Figure 13.

Figure 14 shows the resonance and damping curves taken on a single-wire antenna by Mr. R. B. Bourne at 2BML-2EH. This wire was 195 meters long, and was suspended from trees at a height varying from 15 to 20 feet. It is interesting to note that Mr. Bourne's antenna has a velocity of approximately 93% of the velocity of light at 200 meters and, therefore, shows that a single wire may be used up to a length of over three wave-lengths or approximately 2000 feet. Such an antenna should show very directional properties, but lacks the flexibility and ease of adjustment of the two-wire antenna.

Performance

Two 200-meter wave antennae were erected at Belmar, one running west from the station, and the other running south.

These antennae were arranged with switching such that the connections of Figure 6 or Figure 7 could be selected at will on either antenna. That is, the west antenna could be used for reception from either the east or the west, and the south antenna could be used for reception from either north or south. For comparative purposes a flat-topped single-wire antenna 40 feet high was erected. The effective height of this vertical antenna was estimated as approximately 8 meters. The signals on the wave antennae were about 50% stronger than on the vertical, giving an effective height for the wave antennae of 12 meters. This figure corresponds to about 5½% of the horizontal length of the wave antennae.

Listening tests on these antennae showed marked directive properties, as expected. Listening south, most of the stations heard were in the 3rd and 4th districts, but careful adjustments were necessary to eliminate 2nd district stations to the north. With the antenna directive towards the

was excellent, great numbers of 3rd, 8th, 5th, and 9th district C.W. stations being heard without interference from 1st and 2nd district stations. With the antenna directed east, only local 2's, Long Island 2's, and a few 1's were heard. There was considerable static reduction at times on the eastward reception, as the static was often heavy in the south or west.

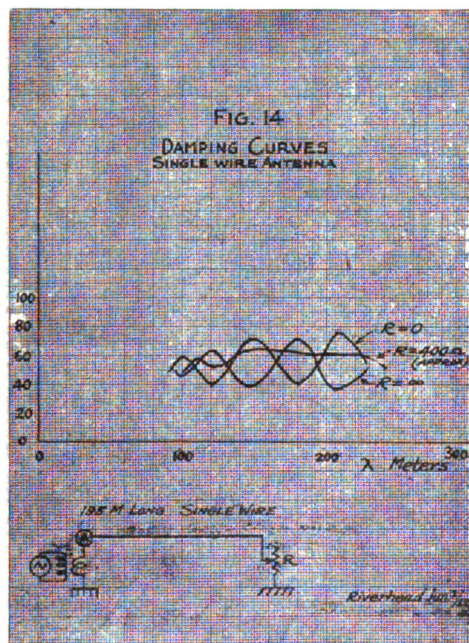
On the 360-meter broadcast station wavelength, very good results were experienced in eliminating interference, particularly when using the antenna for west reception, and cutting out New York and Schenectady interference. Station WOC at Davenport, Iowa, was received particularly well on the wave antenna at times when reception was impossible on the vertical antenna due to local interference.

Even on 600 meters, these wave antennae showed very good directivity, particularly for reception from ships at sea.

Mr. Bourne's antenna at Riverhead, L. I., runs in a direction about ten degrees north of west. He reports his results as follows: "Signals from the south and southwest come in with about 25% to 50% increase in signal strength over a vertical antenna 60 feet high. Signals from New England are, in general, very weak, and in some cases cannot be heard at all when using the wave antenna. No interference from ships or shore stations using commercial wave-lengths has been noticed. WSA, at Easthampton, about 20 miles away, at times has a very strong harmonic on about 225 meters, which interferes seriously with 200 meter reception when the ordinary antenna is used, but due to the fact that this station is southeast, no interference is experienced when using the wave antenna. Radiophones on 360 meters come in with about the same intensity as with the vertical antenna, but often the signal-static ratio is much improved with the wave antenna, and, as with 200 meter reception, interference from WSA and WBC (East Moriches, 10 miles away) is entirely done away with."

The amount of static reduction experienced with the 200-meter wave antenna at Belmar depended entirely upon the distribution of the static at different times. On several occasions very marked improvement was noted in the signal-static ratio when receiving from the east and north, and sometimes when receiving from the west, but it was rarely observed to make any marked improvement when receiving from the south.

The author wishes to acknowledge the valuable assistance received from Messrs. H. O. Peterson, R. B. Bourne, and A. B. Moulton, in the collection of these data on the 200-meter wave antennae.



north, the best reception was from the 1st and 2nd districts, although several 8th district stations were heard. The east-west antenna worked better than the north-south antenna, probably because the ground resistance at both ends was less than an ohm, whereas the ground resistance at the far end of the north-south antenna was very high, nearly 300 ohms, making it difficult to operate the damping circuit effectively. The reception from the west

Rotten QRM

By "The Old Man"

Ever hear of a "wouff-hong"? Know what it is? Sure, you say, it's some kind of a mythical instrument of torture. But do you know where it came from—how it got into the language of us American hams? "The Old Man" coined the expression, and at the same time he discovered the "rettysnitch" and the "ugerumf," which we know so well, in a story in QST away back in January of 1917. QST was just about a year old then and its circulation was so small that we are sure we must have thousands of readers today who will relish learning the story. The following story is reprinted just as it appeared in QST years ago, altho, thank heaven, the QRM conditions T.O.M. wails about are now a matter of ancient history.—Editor.

THIS QRM business is getting my nanny. Here it is midnight, and this msg. from the fellow whose girl has not had a letter from him for a full twenty-four hours is still stalled. I have smoked myself into a state of funk, the floor is covered with burnt matches, I am losing a perfectly good temper, and there is no sign that this will not continue all night long. How long do these radio bugs sit up at night anyway? Right now, as I write, there is that old gink 2AGJ up in York state fluttering along with that bird-in-the-cage spark of his, 8YO is yelling his darned head off for somebody over on the Pacific Coast apparently, 8NH is still trying her best to be lady-like in spite of a full hour of trouble, old 8AEZ is booming out QSA-but-QRM-bad-CUL, 9PC is trying to do something to 5BV, I distinctly heard 4DI say a bad word, and to the best of my knowledge and belief, no one has got anywhere.

What are we going to do about this business? It used to be that we were perfectly satisfied to listen to SLI and once in a while on Saturday night when we could stay up that late we would listen to Arlington send time. When we heard some commercial say QRM, we had to look it up on the chart to see what it meant. Later, we began talking to the fellow over on the other side of town and then was born our amateur QRM. Sometimes the "little boy with the spark coil" (the latter is all right but dog-gone the hide of the former) would try to call us at the same time, and we used to think we were in trouble. Still later we used to think we were bothered when we were in the middle of a conversation with a fellow in the next town and some whop would butt in. It was about this era that we began to organize radio clubs with high-faluting ambitions about "promoting radio communication and controlling interference."

But when we have a fellow who has not written to his girl for a full twenty-four hours and who positively must get the msg. to her over in Illinois, it becomes a serious matter to have some one else getting gay with the ether, especially when the latter has no conception of the existence of the word "brevity." One thing I will say, and

that is that good old 8AEZ is brief. His spark may drown out everybody in the western hemisphere when he sends but he is brief. He says what he has to say in a few words in a few signals and he stops. He also does not go in for long technical discussions about gap speed and condenser construction while forty or fifty others of us are waiting with five or six messages each, many of which have been stuck on the pin a week. Far be it from even me, a real blown-in-the-bottle radio grouch, to find any fault or mention any names, but some of the young gentlemen who burn up valu-



able time every night and thereby multiply this QRM business ought to look up in the dictionary the definition of that particular combination of letters indicated by B-R-I-E-F. I could call off a dozen of them right now, and I would if I thought that editor down east would print them.

The trouble is that the young squirts don't stop to think. They start out and call somebody somewhere every three minutes. Everybody they hear they immediately call. If they can't hear anybody, they send a QST something like this: "QST QST QST QST QST QST de 1 NUT 1NUT 1NUT 1NUT 1NUT 1NUT 1NUT 1NUT Any station more than fifty miles distant hearing these sigs please send postal to Willie le Nut,

Nutville." Willie repeats each word of this msg. three times. Each letter is sent so slowly it puts you to sleep. He uses up just exactly twelve valuable minutes sending out this hog-wash, and drives an old-timer to the point where he radiates brush discharge from every hair on his head. These fellows ought to be limited to hours between supper time and 8:30, and any one of them slopping over ought to get a letter from every respectable amateur within his range threatening to spank him if he ever transgresses again. I know a certain someone who will put his bid for election to the office of Chairman of the Committee on Chastisement.

Here is a sample coming in right now. Listen to this slop: "Columbus co 2pp 18co all sigs charles 9VY u no hf a motor little heavier than the racine sorry OM QRM QRM pse QTA QTA K fish smell rotten yes yes wyd boston how do you get me gap bum bum rubber band QTA pwf about motors [Bad squeaks here—sick spark coil near at hand—wheezes terribly] want to hear tone like commercial? ARK r r r yes ark r r r listen nw."

Here begins ten minutes of the darndest scratching, screeching, groaning, blowing off steam, blubbing that ever mortal ear heard. At its worst it goes in into "— fine fine how do u do it? ARK r r r rubber band on vibrator BANG!—" My friend with the 1 k.w. over on the other side of town explodes. He calls an 8-station. When he finishes the scratches reduce. Then we get the long distance QRM again: "CUL om SK spfacity bunk allemo bish mela hash breakfast wunkey wunkey lala lala 2asj QRM bad qsl 3ZW must go to bed now hw hw abt abt abt msg msg msg pse pse pse k k k." This is the way my log-book this evening looks. It's enough to raise a blister on a wooden leg.

Here is another sample of QRM slush: "v v v v v v v v v v (somebody sitting on his key)—v v v v v v v linneg se with the wice sore feet commercial wirlih." Now what in heaven's name would you make out of this? Is it to the effect that somebody has a line on a commercial who is on the warpath for some amateur with sore feet? One cannot be sure of these matters. It might be that it is the commercial who has the sore feet, chasing some poor amateur around town probably.

Listen to this: "Yes yes jat wyd glucky wait a mt muddy wouff hong bliftsfy monkey motor." We assume from this msg that Glucky is being asked to wait a minute while Bliftsky seeks a wouff hong with which to wallop a monkey the next time the latter faces toward the motor. I do not think I know just exactly what a wouff hong is. Probably some piece of apparatus used in the southern states to beat monkeys with.

It is this form of uninteresting "conversation" which clutters up the air with QRM. Of what moment is it to the rest of the world that this fellow Bliftsky is going to smear somebody's monkey with a wouff hong? When anybody relapses into such mental slop as to want to operate with a thing named a "wouff hong" he ought to



keep his trouble to himself and not compel all of us respectable amateurs to listen to his drool. To put out a lot of foolish twaddle like this when that poor girl out in Illinois has not had a letter since yesterday, is plain wicked.

"Sorry Om qrm qrm 9VY few words schlipsh nuzzle his mucklet faded undershirt cfrish reptg pain in neck sus gup OM CUL ark." This is a real relay, evidently. 9VY over in Fort Wayne is mixed up in it in some way. Whose undershirt they are talking about and what schlipshing one over is, I do not know exactly, altho I have a rough idea. Whether the signals faded or the undershirt faded, or what was the matter with the sus-gup of the neck of the undershirt, I'll be darned if I know.

Just cast a lingering look at this: "Biirgrmp bru rotary GE GE ugerumf OM with my set retty snitch spitty tone hit in potimus?" Now what do you suppose the poor gink was trying to say when he unreeled that? You have to guess a lot in wireless, and how would you guess this? Something is wrong with this fellow's birgrmph, his rotary also has a bad case of the ugerumf and somebody around the place must have spit on his retty snitch, because his tone was so rotten it hit him on his potimus. Sounds bad to me. Why will some people send such personal matter by wireless when the whole country can overhear it? It isn't decent, and it makes the QRM more rotten than ever, and just think of the way it makes a perfectly good log-book appear.

I spent the better part of an hour trying to make out what ailed the poor fellow's biirgrmph, but had to give it up while I listened to a child with a spark coil scratch out this at a rate of around three words a minute: "How do s.....e.....? how be...? how do i cowp.... CW... v v v v--- come in ? ? ? ark." After a long wait another trouble-maker with a bad cold in his head stumbled back with: "R r r r r r r r ok ok please ? ? ? ark." Another pause, followed by the first little demon with: "R r r r r r r qra qra qra pse rat..... ve.....? pse ttt....qta pse repeat ark." These brats kept this up for twenty minutes and they ended up just where they began.

What we ought to do is to organize an Anti-QRM Association. Then let us elect for chairman the worst plug-ugly we can find in these U.S.A. Then let us chip in a little money and hire a clerk with a bad disposition who will write letters threatening the life of everybody whom the members report as causing needless QRM. If anybody gets balky we will all join together and swear the gink is sending with a decrement greater than two tenths, and so report to the local Radio Inspector. If the latter does not within twenty-four hours have the boy arrested and sentenced to life imprisonment, we will all band together and find another job for said Radio Inspector. Let us rise, fellow bugs; rise and crush this octopus which is engulfing and overwhelming us. Eight hours a day and triple time for overtime is death and starvation to our families. Hash for breakfast, rotten smelling fish, and QRM—we

will have naught of it. Down with the fellow with the scratchy spark coil, down with the fellow who calls three-times-three,



down with the fellow who calls everybody he hears, and down-down-down with that unspeakable lid who calls somebody and sends a long relay message repeating each word three times when the station to which he is sending is sending something himself.

There, by heck, I have that off my chest. Now you, over there in Illinois, get this call. Let everybody else stand back from now on. I'm tired and sleepy and cross, and I don't care who I QRM until I get this pin cleared off.

T.O.M.



THE ORIGINAL WOUFF-HOUNG—a well preserved and absolutely authoritative specimen forwarded to the Editor of QST by "The Old Man" shortly after the Armistice. It now hangs in the headquarters office of the A.R.R.L., where the Secretary guards it with his life. Subsequent to the writing of this story T.O.M. chanced upon this mysterious instrument, which is peculiarly efficacious in the elimination of unnecessary QRM. Exact details concerning the method of operating it are a little uncertain but it is believed that one lays hold of the smoother end, and we will have to leave to the imagination what is done with the other savage looking terminals.—Editor.

Transatlantic Notice

A record of 1200 miles over land in the Transatlantic Preliminaries is necessary to secure an individual schedule in the December finals. Many stations are not listed in current call books and it will be difficult for them to secure report cards. QST accordingly volunteers to act as a clearing-house for such reports.

Participating stations not listed in current call-books are requested to file their

QRA with us. Stations logging signals from distances believed to be as great as 1200 miles are requested to send their report cards in our care and we will QSR.

There are two things we should all remember: First, help the other fellow by listening during these tests and being sure to QSL his signals. Second, don't miss this preliminary opportunity to get your receiving set in condition for transatlantic reception.

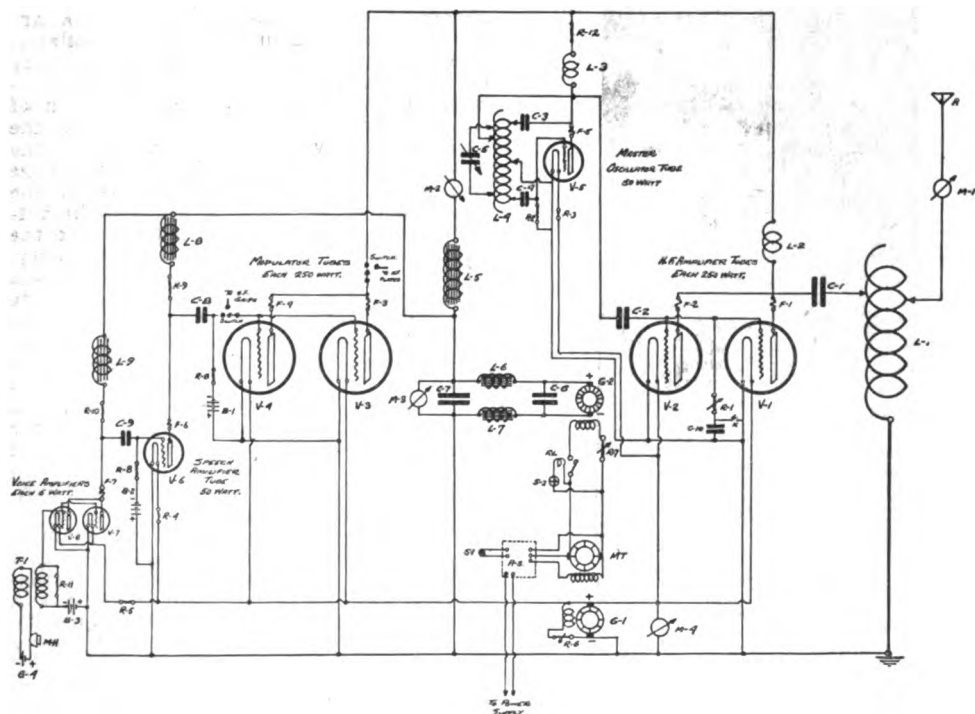
A 1/2 K. W. Radiophone and C. W. Set

By K. B. Warner

THROUGH the courtesy of the Experimenters Information Service we present a description of their type 6371-K Radiophone. This set is primarily a high-power broadcasting equipment designed for operation on 360 meters and our readers may well be surprised, at first blush, to see such an article in QST, as it is considerably out of our field.

However, the design is capable of complying very well with amateur requirements as to 200-meter wave and 1 k.w. power in-

is extremely desirable, as it prevents any changes in frequency with resultant swinging and fading of signals due to irregularities at the transmitter. Now Heising modulation has one defect, namely, it produces a relatively "broad wave" and considerable interference. The explanation lies in the action of this method: The oscillators and modulators are in parallel on a constant-current power supply, and as the modulators pass more or less current in accordance with the voice variations, the

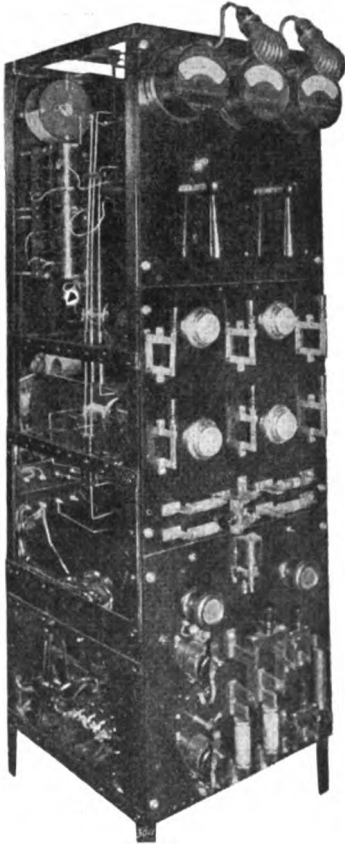


put, and is furthermore adaptable to sets as low-powered as those using 5-watt tubes. It embodies several very interesting points of design, and in general we feel will convey numerous helpful ideas to transmitting amateurs.

First in consideration is the general type of circuit used. It is well recognized, we believe, that the Heising constant-current method of modulation provides more *voice-modulated power* in the antenna from a given number of tubes than any other telephoning scheme. It is likewise recognized that the so-called master-oscillator method for generation of the high-frequency power

oscillators inversely are permitted less current or forced to pass more. These changes in oscillator plate current, in accordance with voice modulation, are evidenced by a similarly changing oscillator plate voltage. Such oscillators change frequency as the plate voltage is varied, and so this Heising "varying-potential" method of modulation causes the emission of a relatively "broad wave." Now when a master oscillator is used to excite the grids of the power tubes, which then act as power amplifiers, in the hope of getting an unvarying frequency, the system works all right until Heising modulation is attempted in the master oscil-

lator and then it acts about the same as before, except for added steadiness in the carrier frequency. The reason is not difficult to see. If constant-current modulation is employed in the master oscillator, the latter takes the form, say, of two small tubes in the usual Heising phone circuit except that the output circuit is a dummy or closed non-radiating circuit, and the



modulated output voltage is conveyed to the power amplifiers. This modulated voltage reflects the same inherent variations in the carrier frequency as previously mentioned in the ordinary circuit in which power oscillators are used.

The present circuit is a solution of this difficulty. The master oscillator excites only the power amplifiers, which thereby generate the oscillating power at constant frequency; and in parallel to these power amplifiers the power modulators are connected. The modulators are thereby enabled to modulate the output in the familiar Heising manner, and even tho this causes a varying voltage on the plates of the power amplifiers it cannot change the frequency

of oscillation, which is determined by the master oscillator. This circuit arrangement appeals to us very much.

The master oscillator in itself is a device about which the amateur should know more. It has a very definite value in C.W. transmission for it ends for all time the trouble of shifting frequency caused by the transmitting antenna swinging in a gale, by varying plate voltage, etc. The scheme is very simple. A low-power tube is arranged to oscillate into any form of a dummy antenna consisting of inductance and capacity, and this circuit is tuned to the desired wave length. As the inductance and capacity of this circuit are concentrated, its frequency is constant. This circuit is then utilized to excite the power tubes. The power tubes are not connected up with coupled grid and plate circuits, for they do not have to generate oscillations—the oscillations are already generated in the master oscillator. The power tubes are connected up very much as amplifiers are in a receiving circuit. Taps are taken across a portion of the master-oscillator inductance and the high frequency voltage applied to the power amplifier grids. The high-voltage is applied to the amplifier plates in the usual manner, series or shunt, and the output circuit of the amplifiers feeds into the antenna, either inductively or conductively. The oscillator tube may always be of less power than the amplifier, as it has only to provide a voltage variation sufficient to swing the power tube *grids* thru the desired voltage cycle. Thus a receiving amplifier tube will serve for one or two 5-watt power tubes, one 5-watt will act for a considerable number of such tubes or for one or two 50-watt amplifiers, and one 50-watt oscillator will serve as an exciter for several 250-watt power amplifiers.

With this introduction, let us examine the circuit diagram for this set. V-5 is a 50-watt tube acting as the master oscillator, and exciting the grids of V-1 and V-2, which are two 250-watt tubes in parallel as power amplifiers. The shunt power supply to the plates of these tubes is fed thru the large choke L-5, which serves to maintain practically a constant current at voice-frequency variations, and in parallel on this same supply are the two 250-watt modulators, V-3 and V-4, whose grids are controlled by the voice variations. The speech, however, is first amplified thru two audio stages, the first consisting of two 5-watt tubes, V-7 and V-8, in parallel, and the second a 50-watt tube, V-6. With what has been said previously regarding the theory, it is hoped that this much will be understood so that we may now proceed to an investigation of the details.

Power Supply

The drawing as shown calls for a 5 h.p. 110-volt D.C. motor, the same D.C. supply

serving to excite the field of the high-voltage generator. The filament supply is shown as a 11-volt 75-ampere self-excited generator, the voltage for the main tubes being controllable by the field rheostat and read on the 0-15v. D.C. voltmeter, M-4, while separate rheostats, R-3, R-4 and R-5, are provided for the smaller tubes. The plate generator, separately excited, consists of two 1000-volt 1½-ampere units in series. The Electric Specialty Co., Stamford, Conn., is prepared to furnish all four machines mounted on a common bed-plate, interconnected with flexible couplings.

The power supply will vary with the facilities, of course. Where A.C. is available we would much prefer to see it used on the filaments. In such case an induction motor would be necessary as a driver, and a small generator would also be required for the generator field excitation.

All of these values are of a magnitude not commonly of interest to amateurs. They are cited here for what few of our number they may interest, to give a general perspective on the thing, and so that an idea may be had of what will be required for lower powers.

The filter is formed by condensers C-6 and C-7, and chokes L-6 and L-7. For the latter, and for L-5 as well, home-made chokes are recommended, each consisting of a straight core 2" x 2" x 14" built up of silicon steel sheets 14" x 2" x No. 29 gauge, and wound with 10 lbs. of No. 20 D.C.C. wire in even layers. C-6 and C-7 each consist of 5 mfd. capable of standing 3500 volts, to secure which it probably will be necessary to connect ten 1-mfd. condensers in series-parallel. The voltmeter M-3 should read 0-2500 volts, with external multiplier.

The master oscillator is also shunt-fed, thru a 6000-ohm resistance R-12, which reduces the voltage sufficiently for the smaller tube used. The r.f. choke L-3, to prevent the high frequency backing up thru the power supply, is a Radio Corp. choke type UL-1655. L-2, serving a similar purpose in the supply to the power amplifiers, consists of 275 turns of No. 28 D.C.C. wire on a formica tube 2½" diam., 6" long. The 50-watt speech amplifier, V-6, is fed thru a resistance R-9, of 6000-ohms, to reduce the plate voltage sufficiently, but instead of L-3 it has an iron-cored choke L-8 to prevent the backing up of the audio-frequency currents. Similarly the two 5-watt voice amplifiers are fed thru L-9 and a 40,000 ohm resistor, R-10. L-8 and L-9 may be Radio Corp. chokes type UP-1654.

The plate current is read on meter M-2, which should be a D.C. instrument reading 0-3 amperes.

The Master Oscillator

This looks like the ordinary Hartley circuit, with the condenser C-5 shunted across

the inductance and taking the place of the antenna. For 360-meter work it is recommended that L-4 consist of 150 turns of No. 20 D.C.C. wire, double-spaced and tapped every turn, wound on a 3½-inch formica tube, 20 in. long. For 200-meter work this small diameter should be maintained, for ease in adjustment, but the number of turns reduced proportionately. C-5 should be variable in steps, from .0001 mfd. to .001 mfd., while the blocking condenser C-3 and the grid condenser C-4 may be fixed .002 mfd. capacities. Grid leak R-2 may be the usual 5000-ohm resistor, tapped at 2500 ohms.

The Power Amplifiers

Note the tap on the master-oscillator inductance whereby a variable voltage is conveyed to the grids of the H.F. amplifiers. The proper bias is maintained on these grids by condenser C-2, .002 mfd., with its 2500-5000 ohm leak, R-1, which should be the larger size Radio Corp., UP-1719.

Referring to the modulator tubes, small switches will be seen whereby the modulators grids and plates may be placed in parallel with those of the H.F. amplifiers, making full power available for C.W. telegraphy. A key is shown in series with the power amplifier grid leak, blocking the tubes when it interrupts the circuit, and shunted by a 1 mfd. condenser C-10 to absorb the "click" and prevent local "popping."

The amplifier tubes feed into the antenna circuit thru a .002-mfd. blocking condenser. As here shown, the coupling is conductive, by the medium of L-1, which may consist of 25 turns of heavy ½" edgewise-wound copper strip on an 8-inch diameter. Antenna current is indicated on M-1, which should be a 0-10 amp. thermo-couple if the set is to be used for phone only, and higher if arrangements are made to use all tubes as power amplifiers. Care should be used that the total input to the plates does not exceed the legal limit specified for amateur purposes.

The antenna clip on L-1 adjusts the antenna circuit to resonance with the master-oscillator frequency, as indicated by maximum antenna current. Changing the position of this clip naturally varies the antenna output but it cannot affect the wave length, which is determined solely by the frequency of the master oscillator. The plate clip on L-1 controls the power input to the amplifiers and should be adjusted for lowest space current as indicated on M-2 consistent with good output as evidenced on M-1—in other words, it is adjusted for greatest efficiency. In commencing the first adjustments this clip should be at the top of the helix so as to include all the turns in the plate circuit.

The Speech Amplifiers

The voltage fluctuations caused by the voice across the secondary terminals of

the modulation transformer T-1 are not sufficient to control the grids of the large modulator tubes and consequently the two stages of audio-frequency amplification previously referred to are employed. The secondary of T-1, shunted by a $\frac{1}{2}$ -meg. leak to avoid saturation, feeds into the paralleled grids of the two 5-watters comprising the first stage of amplification. B-3, of 67½ volts, maintains a bias on the grids. The output of this stage is capacitatively coupled to the next stage by means of condenser C-9, a $\frac{1}{2}$ -mfd. mica type, while the bias is preserved by the 67½ volt battery B-2 and a series resistance, R-8, of 20,000 ohms. The output of this stage in turn feeds the grids of the modulators, by an identical coupling and biasing arrangement.

Arrangement

The experimenter probably will prefer to lay out his apparatus on a long table, and this is by far the best method until the set has been completely mastered. Our photograph, however, shows what can be done in the way of building it up into a panel set. Three black insulating panels,

24" x 24" x $\frac{1}{2}$ ", are required, mounted on an angle-iron frame. This frame may consist of four pieces of $1\frac{1}{2}$ " x $1\frac{1}{2}$ " x $\frac{3}{8}$ " by 6'6" long for the corner pieces, thereby raising the panels 6" from the floor, with cross members of $1\frac{1}{2}$ " x $\frac{3}{8}$ " bar iron, the entire frame being bolted or riveted together. The lower panel should carry the automatic starter, power line switches, generator field rheostat, relays if any, etc. Behind this panel are mounted L-5, L-6, L-7, C-6 and C-7. The tubes are mounted behind the center panel. The upper panel carries the four meters and two pilot lamps. In the rear, at the top, is another 24 x 24 x $\frac{1}{2}$ panel carrying L-4, L-5, C-3, C-4, R-2, R-3, L-3 and R-12, for the master oscillator. In the rear, at the bottom, a strip 24 x 3 x $\frac{1}{2}$ is provided, carrying the terminals for power line, generator, microphone, key, control switches, antenna, ground, etc.

The foregoing data are presented thru the courtesy of the Experimenters Information Service, of 220 West 42d St., New York, who have available for distribution complete sets of blue-prints covering the entire construction of this equipment.

Arrangements for 1922 Transatlantics

By F. H. Schnell, Traffic Manager

NOTHING in the history of amateur radio has stirred up so much enthusiasm among the radio amateurs as has the announcement of the third series of A.R.R.L. Transatlantic tests which appeared in October QST.

Practically every amateur in the United States is brimming over with an eagerness for the night of the tests. At no time has such activity been shown in the overhauling of transmitters, because the success of Godley in copying stations using one or two five-watt tubes shows clearly that every station has a chance, and each man is out for his chance. Receiving equipment is being constructed and overhauled. Every man wants to be the first one to hear a European amateur signal. There is a certain something attached to "the first amateur to hear England or France," and radio frequency amplifiers and superheterodynes are being tested by those who want the last word in reception.

The whole amateur fraternity is running at fever heat and indications are that the tests will eclipse all other events.

Those who do not qualify for the final tests need have no fear of losing out entirely. There will be a free-for-all period each night in addition to the individual schedules.

The tests will start on December 12th and end December 31st. American and Canadian amateurs will transmit for ten nights, beginning December 12th and ending December 21st. From December 22nd until December 31st, English and French Amateurs will transmit and American and Canadian Amateurs will listen. That will be our chance, men, our chance to show our skill in reception!

Through the kindness of Mr. W. A. Winterbottom, Traffic Manager of the Radio Corporation of America, MUU on 14,200 meters and WII on 13,600 meters will broadcast at 2 A.M. Eastern Standard Time the results of reception by the English amateurs.

The one big thing to remember is that we want an absolutely quiet air every night from 7 P.M. to midnight (E.S.T.) when we listen for English and French signals. Just bear in mind that one transmitting station may spoil the whole evening for everybody.

It might be well for you to get your clock squared off for Greenwich Mean Time because the entire schedule will be in G.M.T. The final details will appear in December QST, where the complete schedules will be given. Get your station ready and watch for the final announcement.

A One-Tube Super-Regenerator

First Prize Winner in QST's Contest

By A. L. Groves, 3BID

WHILE it is entirely too early to determine with accuracy just what possibilities the "super" offers the average amateur, there is little doubt that this arrangement in some form will gradually take the place of our present regenerative sets just as C.W. transmission is gradually taking the place of spark. As by far the greatest possibilities of the super are to be had when receiving from C.W. stations it begins to look as tho the spark transmitter and regenerative receiver will soon be a thing of the past for the majority of amateurs.

However, it is well to caution the reader right at the start not to expect too much from the super. Capable as it is of picking up and amplifying the faintest signals, its great sensitivity in this respect is in a measure really its undoing, as static, arc interference, local electrical disturbances, etc., are also picked up and amplified, partly at least annulling the effects of super regeneration.

On the other hand the super is so flexible in its character that almost any degree of signal strength or ratio of signal strength to interference can be had by using different values of inductances and capacities in the different circuits, and while it will be impossible to use the super at high efficiency all the time, even at low efficiency its DX ability will far surpass our best regenerative sets and it is certainly a great advantage to have its wonderful powers at your command at all times.

Its minimum efficiency in signal strength and distance closely approaches our present regenerative sets without amplifiers, while its maximum efficiency seems to be limited only by our atmospheric and interference conditions. The maximum output of course is limited by the tube characteristics and battery. The average relay man

cares little about this, preferring, as "LQ" says, a moderate signal strength without the orchestral accompaniment.

The super alone will not give the extra-ordinary signal strength that was first apparent from the demonstrations given by Mr. Armstrong and if such signal strength is desired some form of A.F. amplification must be used as was used during the demonstrations, but for comfortable operation with phones on the head amplifiers are not necessary or desirable.

There are several different methods of producing super regeneration but as far as the general amateur is concerned the single tube method seems to be far the simplest, cheapest and best of them all, as it will do everything the two tube arrangements can do and then go them some better. The third tube in the so-called three tube sets being nothing but an A.F. amplifier, and the best re-

sults for amateur purposes being obtained with the single tube method, adding an amplifier to it will of course produce even louder signals from two tubes than is possible from three. It has been stated that the two-tube arrangements are simpler to operate

Our Super-Regeneration Contest

Our contest for the best practical articles on the application of the principles of super-regeneration to amateur work, as announced in the August QST, closed on October 1st. The judges have carefully gone over the manuscripts entered and have made awards as follows:

First Prize, \$50

A. L. Groves, 3BID,
Brooke, Va.

Second Prize, \$25

James Wood, jr., 2ALG,
New York City

Third Prize, \$15

Leon W. Bishop, 1XP,
Athol, Mass.

Fourth Prize, \$10

Wm. Englebreton,
St. Paul, Minn.

The first prize article appears in this issue of QST. Mr. Groves is an old-time contributor to our magazine, and his articles on honeycomb coils and their operation, and the construction of single-layer coils for short waves, have been valuable additions to amateur literature. He writes always from an intensely practical viewpoint and so we are confident that his super article will be of decided help to the A.R.R.L. amateurs. QST's contest has not developed the last word in super-regeneration, by any means. It did not aspire to, as the time was much too short. It has accomplished its purpose, however, in bringing to light in the least possible time some "practical working dope" on the subject.

The other prize-winning manuscripts will be presented as rapidly as possible.

than the single tube, and while in a way this might be true to those entirely inexperienced in adjusting a regenerative set, to the general amateur who knows something about it the single-tube method will offer even less trouble than the two-tube methods which are of necessity more complicated.

The Circuit

The accompanying diagram, Fig. 1, represents such a single-tube arrangement and as will be noted this represents nothing new to the amateur except the oscillator coils, L4 and L5, with their accompanying condensers. Neither does tuning present any more difficulty than the regular regenerative set, for the oscillator circuit is thrown into oscillation by varying C4 and once adjusted to the desired frequency no further attention is necessary over a consid-

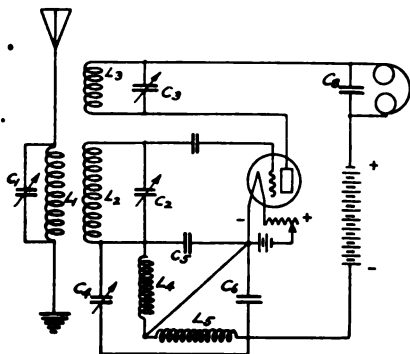


FIG 1

**CONSTANTS, 175 TO 250 METERS
OSCILLATOR AT APPROXIMATELY 8,000 CYCLES**

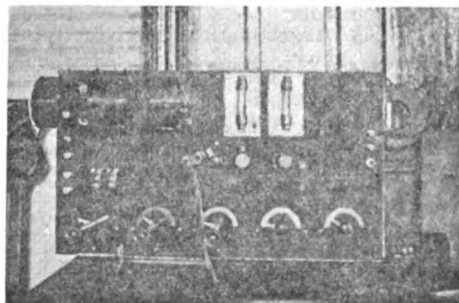
- | | | |
|----------------|-----------------------------------|-----|
| L ₁ | Primary, 15 turns 3" dia. | |
| L ₂ | Secondary, 58 turns 3" dia. | |
| L ₃ | Plate or Eickler 40 turns 3" dia. | |
| L ₄ | Grid oscillator DL-1550. | |
| L ₅ | Plate oscillator DL-1250 | |
| C ₁ | 67 plates (.0015 mfd max.) | |
| C ₂ | 13 plates (.0025 " " ") | |
| C ₃ | 7 plates (.00015 " " ") | |
| C ₄ | 67 plates (.0015 " " ") | |
| C ₅ | .0025 mfd. fixed, Dubilier type | 600 |
| C ₆ | .001 " " " " | 601 |
| C ₇ | .0002 " " " " | 601 |
| C ₈ | .001 " " " " | 600 |

erable band of wave lengths, and the regular regenerative part is adjusted much the same as if the super were not in existence.

This circuit can be arranged in a number of ways but there is little or no advantage to be gained by changing about and the best plan is to arrange the circuit one certain way and then stick to it until its characteristics are learned.

The larger the oscillator coils, L4 and L5, and the larger the condensers C5 and C6, the lower the frequency; and as best general results seem to be obtained with frequencies around 8,000 to 10,000 cycles per second, DL-1500 is usually the preferred

coil for L4 (which is shunted by a .0025 mfd. condenser) and DL-1250 is then usually correct for L5 when shunted by a .001 fixed condenser. This arrangement, when coupled by certain values of C4 allows the circuit to oscillate at about 8,000 cycles. Using DL-1250 at L4 and DL-1000 at L5, with the same condensers, will give about 10,000 cycles. Either of these two arrangements seems to give about the best practical results at wave lengths approximating



Mr. Groves' Super. Only one tube is used.

200 meters, the first arrangement probably having preference especially where wave lengths in excess of 200 meters are to be received.

The amplifying power of the super is apparently governed by the difference in frequency between that of the received signal and that of the oscillator circuit, rather than by the actual frequency at which the oscillator is working, and little advantage seems to be gained by lowering the frequency much below 8,000 cycles. 200 meter signals have a frequency of 1,500,000 cycles and the difference between this and 8,000 cycles is 1,492,000 cycles. Lowering the oscillator frequency one-half or to 4,000 cycles will only make a difference of 4,000 cycles additional, or a total of 1,496,000 cycles. If instead we lower the wave-length of the received signal one-half, giving it a frequency of 3,000,000 cycles (100 meters), the difference between the oscillator and signal frequency will then be 2,992,000 cycles, making an enormously greater difference than could be possible by lowering the oscillator frequency.

Therefore it is at once apparent that the amateur can get much better results from his super if the transmitter is operated below 200 meters instead of above 200, as is the general rule at present. Also as the super tunes rather broad the shorter wave lengths offer greater benefits in selectivity as well.

While I have always been in favor of condenser-tuned sets for short wave lengths, this type of set is especially desirable for the super regenerative sets and

in fact if best results are to be maintained over any considerable range of wave lengths the condenser tuned sets are actually a necessity, operated of course in connection with different values of inductance for different wave lengths.

The Panel Lay-out

The diagram, Fig. 2, represents a method of constructing such a set wired as in Fig. 1. This drawing is to scale, the actual size of panel being 12" high and 14" long. L1, L2 and L3 are the mountings for the regular regenerative coils, and are placed 2 1/4" apart so as to accommodate the single layered coils.

This particular plan is designed for use with a Myers tube but any amplifier tube may be used by arranging the socket to accommodate the tube decided on. However, the Myers tube is especially recommended due to its high amplifying power, freedom from gas, non-criticalness of adjustment and low operating cost, it consuming only .8 amperes at 4 volts.

C1 is an Illinois 67-plate condenser, C2 a 13-plate, C3 a 7-plate and C4 another 67-plate, all of which are equipped with 5" extension handles.

L4 is a regular panel plug and L5 a regular coupling plug, for the oscillator coils, the latter being as a rule kept at right angles to L4 and the coupling between them varied by C4 instead of inductively. There is, however, no harm in using low values of inductive coupling and no special requirements to keep the coils at right angles are needed.

The regenerative coils should be wound on a bakelite cylinder 3" diameter and with ordinary amateur aerial and ground connected in the regular manner, for wave lengths between 175 and 250 meters, L1 should have approximately 15 turns, L2 56 turns, and L3 40 turns. For wave lengths between 240 and 350 meters, L1 should be about 25 turns, L2 75 turns and L3 56 turns. For wave lengths between 350 and 500 meters, L2 should be 100 turns and L3 76 turns. 25 or 40 will do for the primary. It is important that the plate coil, L3, be kept closely coupled to the secondary, L2.

The ratio of inductance to capacity of L2-C2 has a very important bearing upon selectivity and while for maximum signal strength it is best to keep C2 low and L2 high in value, actual work through interference often requires these values to be reversed, and while in such cases we get reduced signal strength from what could be obtained if the interference were not present we get readable signals even under conditions of interference sufficient to entirely drown them out when low capacity and high inductance are used.

Adjustment

Assuming the amateur has built a set closely along the above lines, the operation will be about as follows.

First, the coils for the wave length selected are placed in the regenerative mountings, coupling L3 to within half an inch of L2. C2 should be advanced to maximum and C3 placed at zero, which renders them entirely inoperative. The HC or DL-1500 coil is placed in mounting L4 and HC or DL-1250 in mounting L5, and swung to approximately right angles. Slowly advance C4 and a low thud followed by a faint high pitched tone in the receivers should be heard, which denotes the oscillator circuit is working at an audible frequency and is ready for action. If the oscillator circuits are correct the A.F. hum should stop as soon as the condenser is lowered to a few degrees above the zero position. If it does not stop a smaller coil should be placed at L5. If the condenser has to be advanced a considerable distance before the

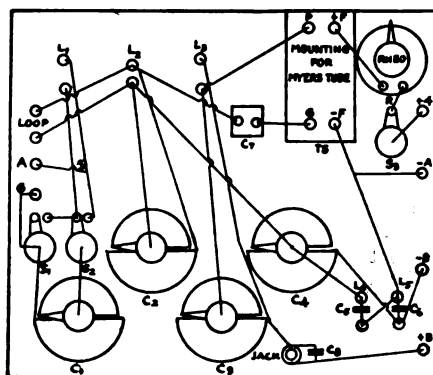


FIG. 2

hum starts, a larger coil should be used or a larger condenser at C6, or the coupling may be closed a little between the coils, but at no time should this be sufficient value to allow the A.F. hum to continue when C4 is at zero.

Second, as soon as the A.F. hum has been settled, leave C4 just above the point where the hum starts and with the hum buzzing faintly turn C2 from maximum towards zero slowly and as it approaches zero a hissing sound will be heard, which will be followed by signals regardless of the primary adjustment. Adjustment of all three condensers slowly and carefully will then serve to clear up all noises and bring the signals in clear and distinct, though it takes practice to bring this about and many harsh and peculiar sounds will be encountered which at first are liable to disgust one entirely. However, with a little practice it will be found that each sound has a mean-

ing and it is just as easy to keep out of the unpleasant ones as it is to keep our present regenerative set from spilling over into oscillation. If the oscillator circuit has a tendency to break off or go dead with a sharp click in the phones upon varying the regenerative condensers, it denotes either too much B battery, not quite enough capacity of C4, or probably insufficient value of C7. It is well to start operating the super with low values of plate voltages, as the howls and squawks will be greatly lessened and while results will not be as good in the way of signal strength it will

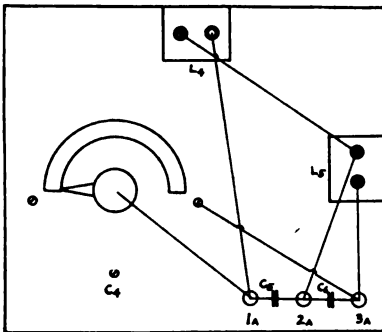


FIG 3

give you a better show at learning. 45 volts B battery on a Myers tube should be used at the start.

Also the value of C7 has a big influence on the howls and steadiness of tube, and values between .0002 and .00025 mfd. seem best for general purposes. The A.F. hum should be watched and not allowed to become loud, as there is nothing to be gained in the way of practical operation and best results are obtained with the hum entirely unnoticeable when signals are coming in. As plenty of signals will be heard to practice on, it should not take long to get the run of things sufficiently to allow for fair operating results; the fine points will come in due time. It is impossible to explain them in detail nor is it necessary to offer such explanation to the amateur already familiar with regenerative receivers.

The main issue is to select the best frequency of the oscillator circuit in connection with the value of C4, and the best ratio of inductance to capacity of L2-C2.

The following combinations of coils will be found to work in the oscillator circuit. L-4, two DL-1250 coils clamped together and connected in series, with DL-1500 as L5. L4, DL-1500, with DL-1250 as L5. L4, DL-1000, with DL-600 as L5. L4, DL-750, with DL-400 as L5. These are about the extreme limits practicable. When the smaller coils are used, no A.F. hum will

be had in the receivers, due to the fact that the circuit is oscillating above audibility; and the only method to determine that the oscillator is working is by the faint thud occurring when C4 passes a certain point. The operating is done with C4 just above the point where the thud is heard.

Besides changing the oscillator coils, C5 and C6 may also be changed to different values with more or less success. However, in the long run for general results after the correct values have been determined to suit your own requirements of interference, etc., very little heed will be given the oscillator coils or condensers and they will be seldom changed or thought of. Each individual should go over all possible changes in values before deciding upon any one and see for himself which gives the greatest *working* combination regardless of actual signal strength.

Notes on Operating

The actual operating of the set depends much upon the individual and what he desires to accomplish at any given time, and there are at present no fixed rules to follow in all cases. However, a brief outline of the operation as it appears to me during the short period it has been in use may not be amiss.

First of all the operation will be started with the oscillator working within audible frequencies in practically all cases—which is denoted by the faint hum heard in the phones. If the set has been properly constructed and the correct size coils used at L4 and L5 this hum will start with C4 close to zero position. However, it should be remembered that the value of the B battery will make this point vary somewhat and if it is impossible to make the A.F. hum stop with C4 at zero a smaller plate oscillator coil should be used.

It will be at once noticed that spark stations are conspicuous for their absence and what few do come through will be in a low cracky tone. However, if the condenser is kept close to the point where the A.F. hum first begins the reading of spark stations will not be difficult and C.W. stations will be heard nicely also. However, it appears that for best results the strength of oscillations should in a measure correspond to the strength of the incoming signals if it is desired to take full advantage of the super, while at the same time the strength of arc or other interference has to be considered.

Where there is no arc interference the operation becomes easier and excellent selectivity can be secured by using the correct value of C4, which controls the strength of oscillations, to correspond to the strength of the incoming signals. In this way if you are receiving from a DX station whose signals are weak, using low values of C4 will give the best results from

this station and you will be little interfered with by some higher power station, as his own strength will tend to choke off any response in the phones. Increasing C4 necessitates a corresponding increase in C3 or a tightening of the coupling between plate and secondary, and then the station with strong signals will come roaring through and not a sound of the former weak station will be heard. This also applies to other interferences such as static. If static is of a certain strength, say of an audibility of 200, and you have a station whose signals can be made say 400 or 800 audibility, then by adjusting C4 to correspond to the best workable strength of the received signal you will not know any static is in existence as long as that station is transmitting. This is unlike any other set, for as we are used to at present the static is heard popping away regardless of the strength of signals. The super can be so adjusted that static will not be heard if the signals are louder. On the other hand if static happens to be fairly severe it will predominate over everything and NO signals will be heard at all. At such times work can only be

shows the set to be improperly adjusted. Generally if a C.W. station takes a low tone the oscillator is too high for this station's signal strength or the plate and secondary condensers are improperly adjusted. If a C.W. station tends to choke up, the oscillations are not strong enough. If static predominates, the oscillations are too strong; if arc interference prevails, they are too strong; and if signals tend to choke up the variation oscillations are not strong enough.

The same methods are applicable to the reception of phone signals and the best value of C4 must be selected to correspond with the strength of voice. If the oscillations are too strong the voice will tend to be broken. If stronger than the prevailing interference the voice will entirely disappear. But when properly adjusted, phone signals are almost perfect in their clearness, not even a trace of the carrier wave being present. (This of course not applying to some improperly adjusted transmitters.)

It takes considerable time to get on to operating the super to best advantage at all times, and I am sure I have not begun to learn even yet, which leads me to expect the super to be the ideal set for short waves within a very short while.

The reception of spark stations with the super is at best unsatisfactory. The moment oscillations start in the oscillator circuit, whether audible or not, the natural tone of the spark disappears. However, amplification sets in immediately and with C4 just at the point where oscillations begin the note is not at all unpleasant, and by carefully adjusting C4 and the regenerative condensers a tone very near the true tone can be obtained with results about equal to a one step R.F. hooked on to a regular regenerative set, but the set in this condition is not very stable and hardly worth the trouble it takes to adjust it to this condition.

On the other hand as soon as the oscillations stop the set is no longer a super, but acts exactly like a regenerative set plus the resistances of the oscillator coils. All classes of stations can be heard and worked exactly as on a regenerative set, the extreme distance of a regenerative and soft detector not being possible but possibly equally as strong signals are obtained due to the higher voltages and amplifying power of the tube.

At this point under certain adjustments the usual harsh squeal will be heard when C3 is too high. Also it will be noted that another different squeal, resembling the A.F. hum of the oscillator but a little stronger, will be heard. This is a frequency generated by the tube alone and in a manner turns the set into a super though at much less efficiency. Nevertheless the principle is the same and it will be found

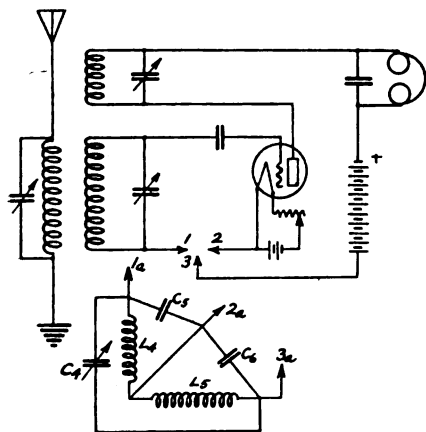


FIG 4

done by using C4 as low as possible and still keeping the A.F. hum audible. The same applies to arc interference. When this is present the condenser has to be worked at low values and excellent results can be obtained, but the very moment the condenser is adjusted to such a point where the strength of oscillations corresponds to the strength of the arc interference, all signals will disappear and nothing but the arc QRM will get through, unless of course signals of nearby stations that are stronger than the interference.

It will also be noted that under different adjustments the C.W. stations are heard with different tones. In all cases this

that sparks cannot be received in their true tone in this manner any more than with the regular oscillator coils working. Take the grid oscillator coil out entirely and the set still remains a super as long as that little squeal is heard. Take the plate coil out entirely and increase C3 a little, and the set is still a super. Short-circuit C6 and decrease C3 and the super effects will still be had. Short-circuit C5 and most of the super ability will disappear and the set will generally break off into the loud squeal instead of the faint A.F. squeal. This would tend to show that the variation frequency is being generated by the tube itself, assisted by the condenser C5 which probably breaks the frequency up by becoming alternately charged and discharged. While this method of producing super-regeneration is hardly practicable, it is nevertheless super-regeneration in a way, and there is room for further experiments along this line.

Using the above methods of adjusting the strength of oscillations, in connection with different ratios of inductance to capacity in the secondary circuit, and using the various methods of collecting signals such as with ground alone, aerial and ground both connected, loop acting alone or collecting signals from the ungrounded aerial, or simply allowing the secondary coil to collect them (if the set is so placed that the winding runs in the same direction of the aerial) etc., will allow the super to be operated to advantage at all times and under conditions that would absolutely shut down a regenerative set, but like everything else worth while it will take time and patience to learn.

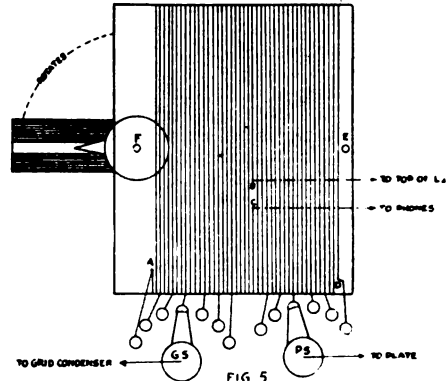
Aerials, Etc.

The operation of the super with both aerial and ground connected in the regular manner is possible, yet it does not work as it should. Disconnecting either aerial or ground and tuning the primary coil with C1 in parallel seems to work just as well if not better.

The super seems to be entirely able to collect its own signals without being bothered by aerials or grounds, and the secondary coil will collect signals from a considerable distance in the direction parallel to its winding if the set is ungrounded.

Also excellent results can be obtained by allowing the secondary coil to collect signals direct from the aerial, which can be accomplished by having the secondary coil parallel to the direction of the aerial and leaving the set ungrounded, and when used in this manner results superior to the best of regenerative sets can be had even if the secondary coil is not more than 3" in diameter. This same principle applies also if the set is grounded and the coil placed at right angles to the aerial, but the results are not nearly as good.

Posts are provided in Fig. 2 for loop connections and excellent results can be obtained with the loop acting either alone or picking up signals from the ungrounded aerial. However, too much dependence should not be placed in the loop for selectivity, as signals will come through from considerable distance with nothing but the regenerative coils acting as collectors, partly annulling the directive effect of the loop.



Many combinations of connections of aerial and ground are possible and different ways give different results at different times and the whole success at any given time seems to depend upon conditions of interference. With little or no interference the best results seem possible with aerial and ground connected in the regular manner, but unfortunately this condition seldom prevails as even if there is no direct amateur interference some of the mush from the high power arcs is always present and this seems to choke up the amplifying power of the set and introduce a disagreeable hissing besides causing signals to swing badly, one letter being very loud and the next probably inaudible. This can at least be partly overcome by using other methods, sometimes a turn or two of wire wrapped around the secondary and connected to the aerial giving almost perfect results as regards ratio of signals to interference. At other times the loop will give the best ratio. At still another the coils themselves are best. There seems to be no "best" method for all occasions and the method must be used to meet existing conditions.

As interferences of all kinds are at a minimum in day-time the super is an ideal instrument for amateur daylight work and in most cases aerial and ground may be used connected in the regular manner to advantage, though other methods can be used as well. As no signals result in the phones when the primary is tuned to the exact wave of the incoming signals it has been found advantageous to use no ground connection at all and an aerial somewhat

above the natural wave-length of the received signal. These are only a few suggestions and many more can be tried and found advantageous under different conditions, but where aerial is used in any method the efficiency of the set will be found to correspond to the efficiency of the aerial just as it does with our present regenerative sets.

A Separate Generator

If the amateur has a good regenerative set of the coil-condenser type it can easily be turned into a super. The oscillator circuit should be made on the order of Fig. 3 which is drawn to scale, the actual size of panel being 6" high and 7" long. L4 represents the plug mounting for the grid oscillator coil and L5 for the plate. C4 is either a .001 mfd. or preferably a .0015 mfd. air variable. No extension handle will be necessary for this condenser. C5 is a fixed mica condenser of .0025 and C6 one of .001 mfd. capacity, the Dubilier type 600 being recommended. The set is wired up as shown, though C5 and C6 may be connected directly across L4 and L5 terminals if more convenient, instead of across the binding posts 1A, 2A and 3A as shown.

The lead from the secondary to the filament of the regenerative set should be disconnected and attached to the post 1A on the oscillator. The lead from the plate to the filament should be disconnected and attached to post marked 3A on the oscillator and the post marked 2A on the oscillator should then be connected to the filament of the regenerative set. Fig. 4 shows the idea, where all connections to filament are broken at 1, 2 and 3 and their ends connected to 1A, 2A and 3A of the oscillator.

Constructing a Tuning Inductance

If the amateur does not like the idea of changing coils for different wave-lengths, an efficient set of coils is shown in Fig. 5 which makes a most desirable arrangement for wave-lengths between 150 and about 450 meters, allowing quick and convenient changes in ratio of inductance to capacity for all requirements and at the same time providing the close coupling necessary between secondary and plate. A cylinder $4\frac{1}{2}$ inches long was used for this purpose, the outside diameter being $5\frac{1}{2}$ inches.

The winding is started at "A," Fig. 5, which is $\frac{1}{4}$ " from end of cylinder. No. 20 enameled wire was used and a total of 50 turns wound to "B," taps being taken off at 10, 20, 25, 30, 35 and 40 turns, which with the first lead "A" makes a total of 7 taps which are connected to the points of switch GS as shown. Winding is again started at "C" and a total of 40 turns wound to "D," which should leave a space of $\frac{1}{4}$ " between this and end of cylinder. Taps are taken off at 10, 15, 20, 25 and 30 turns, which with the lead "D" makes a total of

6 taps to be connected to switchpoints of switch PS.

At right angles to the point where the taps are taken off a hole is drilled as at "E" for holding the coil to panel. On the opposite end a hole should be drilled as at "F" which serves not only to hold coil in position on panel but also for the primary bearing to work through.

The primary should be 5" outside diameter and wound with about 18 or 20 turns of wire. 1 to $1\frac{1}{2}$ inches wide will do, and a space about $\frac{1}{4}$ " left in center without winding for the bearings, which are made of a couple of ordinary switch levers and a few extra washers and nuts. These make an excellent smooth running and positive contact bearing.

When completed this may be mounted on the panel in place of the coil mountings as shown and the operation and results will prove highly satisfactory to those interested only in these wave-lengths. It is possible to get fair results as high as 600 meters with this arrangement, though about 450 is the maximum for efficiency.

General

In conclusion, while the super is capable of giving excellent results at all times, only practice can bring out its full advantages for actual work and it would seem that efficiency is not determined by any actual signal strength but by so adjusting the set as to meet different conditions and getting greatest ratio of signals to interference. The higher the voltage of the B battery the louder the signals, yet it is not advisable to use high voltages at all times, 45 volts working nicely and 90 more than doubling the signal strength. The higher the voltage the lower C4 will have to be adjusted to start oscillations, and on the high voltages it may become impossible to stop oscillations when C4 is at zero. Under such conditions it would be advisable to use a smaller coil at L5.

The length of time the super has been in operation prevents any hard and fast rules from being given as to its operation, and nothing can be stated to be "the best" method as yet. But the operation is so simple and results can be obtained by so many methods that no one should hesitate an instant in making up a super in some form. Then after many get to work on it it will not take long to find what are the best methods suited for general amateur needs. In the meantime let us all unite in extending many thanks to Mr. Armstrong for giving us the fundamental principles of such a wonderful device, which to say the least means as much of an advance over the regenerative sets as the regenerative sets are over the straight audion sets.

[Editor's Note: As to results, Mr. Groves has copied numerous C.W. stations in day-
(Concluded on page 47)]

Daylight Transcons

By F. H. Schnell, Traffic Manager

IT will be remembered that our attempt to put a message across the United States in daylight during the month of July failed. Only by failure do we gain valuable information and the reason for such failure usually is obvious. The answer to the failure of the July Daylight Transcons is that only one fourth as many stations were on the job as were needed.

Now let's get together, fellows, and let's do the job right this time. We don't want to be dragging this thing along all year—we can put a west-bound message to Denver in daylight and you all know it. Of course it is quite a task to get over the mountains, but unless we try, we do not know what we can do. If we get to Denver in daylight, we should be satisfied and if the east-bound message gets over the Rockies, all the more reason why we should have the world know it. That's a real task worthy of the greatest effort.

Thanksgiving Day, November 30th, and Sunday, December 3rd, have been selected for the Daylight Transcons. Now the only thing we ask you to do is to stick on the job until you are satisfied you have done your bit. When all of us are on the job, there is less for any one individual to do and on these two days there is no reason why we shouldn't expect a bunch of stations on the air.

There will be two messages started from the West coast, one from Denver, and two from the East coast. West coast messages will start from Seattle, Washington, and from Walnut Grove, California. One east-coast message will start from Boston, Mass., and the other from Wilmington, N. C. Each message will bear a special prefix and a check. The message starting from Seattle will bear the prefix, "Transcon East Nr 1"; from Walnut Grove, "Transcon East Nr 2"; from Denver, "Transcon East Nr 3"; from Boston "Transcon West Nr 1"; from Wilmington, "Transcon West Nr 2." In this way it is possible to recognize each message as it moves along.

There is only one thing to do with any one of those messages if it reaches your station—keep it moving towards its destination. Do not let it backfire!

During the last tests a few logs were received. In the coming tests we want more logs, men, more logs; we want every one we can get.

The aim is to get these messages across the continent between the hours of 9:00 A.M. and 6:00 P.M. your local standard time.

What do you say, fellows, does it go over this time? You bet!!!

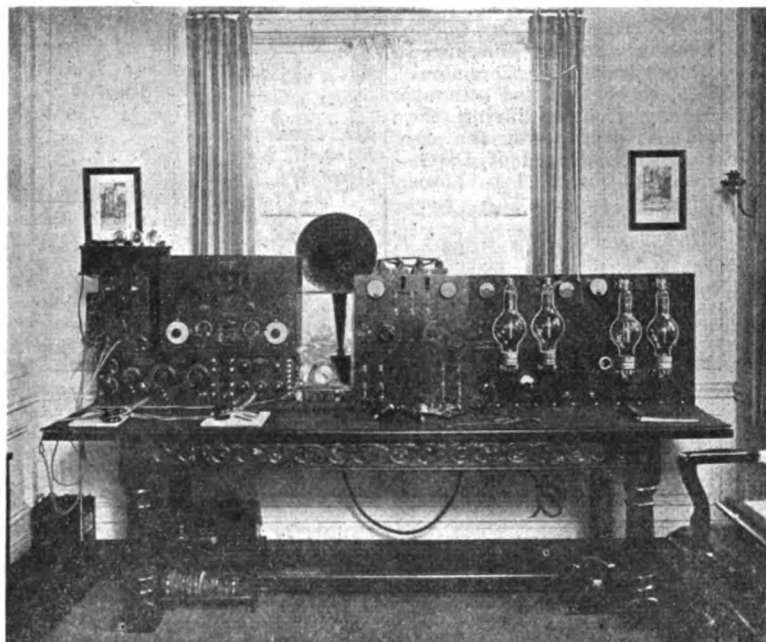


Working Every District in One Night

HOW would you like to do that with your set, O.M.? Some thrill, eh? So say we all of us, but that is just what happened to Mr. W. A. Remy (of 2KV), operator at 1CCZ, Wianno, Mass. Remy has been operating for eight years and that he would come no nearer the Seventh Heaven than when he got a card from a ship reporting 2KV's 10-watt set in the English Channel, but this had everything else stopped.

About 9 P.M. on September 11th Mr. Remy put on the cans and lit the bulbs at

call 1CCZ and say "QRK FB." A message was given him to 6KA but QSS and it is not known if he got it. Canadian 3JK was later worked, and at 5:03 7KX answered a CQ. He was heard plainly but soon lost, as sigs began to grow weaker as daylight came on. 2BRB and 8ADT were worked to even things up, and then it was called a night. A summary of the log shows that four 5's, two 6's, one 7, and twenty-one 9's were heard that night. A total of 92 stations were heard and 31 worked, in nine U. S. districts and Canada.



1CCZ. It wasn't a very good night. The first one to trickle in was 9JA out in Iowa. An attempt was made to get a message from 2AJA but QRN was pretty bad. At ten o'clock 9II was worked, QSA, followed by 4GK and 4FT, then some 3's and 8's until midnight. By that time things were perking up and QRN had decreased, with the DX rolling in. 9ARZ and 5KC were raised but QSS and QRM made accurate work impossible. At 1:50 6TV was logged and was called off and on the rest of the night. At 2 A.M. conditions were ideal, and 8CMI and 1CCZ worked back and forth as if in the same town. 4NT and 4BF were worked, 4BF screeching in on one step. At 3:48 6KA was audible all over the room on one step and at 4:11 6TV was heard to

1CCZ is the station of Edward C. Crosssett located at Wianno, Cape Cod, Mass. and has done some consistent work during the past summer. The station comprises two receivers and two transmitters and is operated by Mr. Remy.

The long wave receiver is a DeForest RS-501 commercial type with one stage of audio frequency amplification incorporated in it. Special wave-meter coils are used on the amateur wave-lengths and excellent results have been obtained with them. A DeForest two-stage audio-frequency amplifier is used in conjunction with this set. For short waves a Paragon RA-Ten with detector and two-stage amplifier is used. Baldwin and Western Electric phones are used and a Western Electric power ampli-

fier and loud speaker can be used with either receiver.

The main transmitter was designed and built by I. R. Lounsberry and is a C.W., I.C.W. and phone transmitter. Two 250-watt Radiotrons are used in the oscillating circuit, which is a Colpitts circuit, and two more are used in the Heising constant-current modulation system. Two 50-watt Radiotrons are used as a speech amplifier. A 2000-volt generator furnishes plate potential for the tubes. All controls are operated by relays controlled from the operating table. The antenna current of

the two oscillators on straight C.W. is six amperes and on phone five amperes.

An auxiliary ten watt I.C.W., not shown in the photograph, is also used. The power service to the station is rather erratic and the auxiliary transmitter was designed to operate on the 110 volt D.C. house lighting plant. A motor-driven chopper delivers 500 cycles interrupted D.C. to the plate and filament transformers. Two five-watt Radiotrons are used and the antenna current is 1.5 amperes. This transmitter has recently been completed and is only used when the power service is interrupted.

K.B.W.

5ZA's 1921 Hoover Cup

SEVERAL months ago we announced that the Department of Commerce Amateur Cup, to be awarded annually by Secretary Hoover during the present administration with the co-operation of the A.R.R.L. Board of Direction, had been awarded for 1921 to Louis Falconi, of the justly famed 5ZA, Roswell, N. M.

Department of Commerce
Office of the Secretary
Washington

August 2, 1922.

Mr. Louis Falconi,
Roswell, New Mexico.

Dear Mr. Falconi:

The Board of Directors of the American Radio Relay League by unanimous vote have decided that you are entitled to the Department of Commerce cup for 1921 in recognition of the notable efficiency of your radio station and your activity in amateur radio work.

It gives me very great pleasure, therefore, to present you with the cup herewith. I also desire to express my hearty congratulations on the success of your work.

Yours faithfully,
(signed) Herbert Hoover.

The cup is a beauty, as may be judged from our illustration. Of solid silver, it stands 10 inches high with a bowl diameter of 6½ inches, a total height on its base of 12½ inches and an overall width across the handles of 9½ inches. On the face is beautifully engraved:

DEPARTMENT OF COMMERCE CUP
DONATED BY
HERBERT HOOVER
TO BE AWARDED TO THE OWNER
OF THE
BEST ALL-AROUND AMATEUR RADIO STATION
IN OPERATION DURING 1921
THE MAJOR PORTION OF WHICH
HAS BEEN DESIGNED AND CONSTRUCTED BY
THE
AMATEUR HIMSELF

On its reverse side it bears the following inscription:

AWARDED TO
LOUIS FALCONI
STATION 5ZA
ROSWELL, NEW MEXICO

The cup has now been forwarded to 5ZA accompanied by the following letter from the Secretary:

Fine business, eh? With the return of good weather Falconi advises that traffic



west is again moving heavily over the southern route and 5ZA is all ready with a brand new station—new aerial, new transmitter and receiver, new counterpoise. First transmission of the season brought cards from every district but the Fourth, with numerous 1's and 2's, using two 50-watters. The Ad Club and Commercial Club of Roswell have shown their appreciation of Falconi's work too, and are donating him two additional 50's which will soon be warming up alongside their brothers.

The Department of Commerce Cup is the highest honor that amateur radio can

bestow upon a devotee. A cup will be given for each calendar year during the present administration, to America's best all-around amateur station in which most of the apparatus is home-made. Full particulars were given on pages 20, 21 and 22 of *QST* for January, 1922, to which interested parties should refer. Entries for the 1922 award will be received by The A.R.R.L., under whose auspices the award is made, up to Jan. 15, 1923. Bear this in mind, O.M., and think over the preparation of your exhibits as called for in the regulations.

K.B.W.

The Canadian Convention

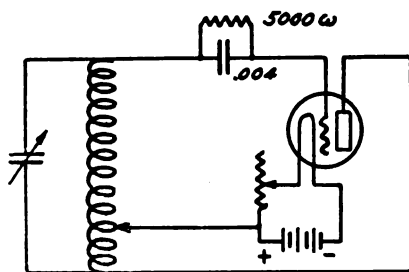
CANADIAN Amateur Radio had its first big convention at the Prince George Hotel in Toronto on the 8th and 9th of September, under the auspices of the Wireless Association of Ontario (affiliated), and, in the words of the small-town newspapers, "A large time was had by all." Several hundred radio bugs, mainly amateurs, attended the sessions, and the job was put over in bang-up style. A good radio show and exhibit occupied stalls around the edge of the convention hall and in several adjoining rooms. Technical papers were presented at some meetings, an amateur gab-fest was held and amateur work talked over, and on the night of the 9th a banquet was held which will ever remain one of the bright spots in radio for those who attended it.

A very considerable number of the amateurs present were from the United States—Connecticut, New York, Pennsylvania and Ohio, for the most part.

The apparatus exhibit was a very interesting one, particularly the variety of tubes displayed. The Canadian amateurs have it all over the U. S. hams in the array of valves from which they may select. The Canadian General Electric Co., makes the full line of Radiotrons for Canadian sale; U. S.-made Western Electric 50-watt oxide-coated-filament tubes can be had from some source; the Marconi Company's Canadian branch offers the V-24 and other Marconi-Osram valves; Perkins, Ltd., are importing a quantity of the Dutch Phillips lamps on standard bases; the Northern Electric Co. manufactures the complete line of Western Electric tubes with which U. S. amateurs are familiar and in addition the "N" tube or peanut which is not available in the States (except that the Westinghouse's WD-11 or Aeriotron is the same tube electrically); and Messrs. Powley & Moody, Ltd., of Toronto, offer a complete array of English-made Mullard valves, re-

ceiving and transmitting. Outside the very high-power tubes there are eight in the Mullard family, ranging from the familiar "Ora" receiving tube to 500-watt power bulbs. Their tubes are rated on safe plate dissipation, and the larger sizes are not based but have four leads brought out thru cambric insulation, filament and grid at one end and plate at the other. The prices are much lower than in the States: the 100-150 watt, \$56; 250 watt, \$85; 500 watt, \$95. Got any friends in Canada?

The various technical and business sessions were ably presided over by A. H. Keith Russell, president of the W. A. O. O. and A.R.R.L. Ontario Division Manager. Among others, papers were delivered by



Mr. J. H. Thompson, chief engineer, Canadian Marconi Co., on Radio Transmission; Dr. W. B. Cartmel, Engrg. Dept., Northern Electric Co., on the "N" Tube; and Dr. C. A. Culver, Research Dept., Can. Indep. Telephone Co., on recent radio developments. One thing particularly caught our fancy in Dr. Culver's interesting talk: the description of an experimental oscillator without "B" battery, which makes an excellent separate heterodyne. The appended diagram shows a circuit in which there is nothing especially novel, the plate receiving a potential above that of the negative end of the filament equal to the "A" battery voltage, at which most hard

tubes will oscillate if properly handled. It was with regard to features of arrangement that Dr. Culver made a contribution: the use of the large grid capacity, 0.004 mfd., with the low leak resistance of 5000 ohms.

The A.R.R.L. Traffic Manager and Secretary attended, representing Headquarters. The latter addressed the convention on the subject of the purposes of the League in Canada and made it quite clear that the A.R.R.L. is lending a brotherly hand to Canadian amateur radio until more stations develop in the Dominion. We all believe that ill-considered and premature moves at a separate C.R.R.L. have been discouraged for all time.

At the banquet, again presided over by the versatile Mr. Russell as Toastmaster, good fellowship reigned supreme. This is a statement which might be made idly of any amateur banquet, but it is the real truth when applied to this one! Sometimes we fear conventions are becoming an old story for us with their eternal sameness, but this banquet was *real*, the air filled with the good old ham spirit and an air of camaraderie that we fancy only the dyed-in-the-wool gang can inject into a get-together. The peppiest and best-all-around entertainer we have ever seen led the bunch in songs and whooped up enthusiasm in great style and things simply hummed.

After the excellent dinner the Toastmaster opened the ceremonies by proposing toasts to H. M. the King and the President of the United States. Mr. F. Burgess, one of the W. A. O. O.'s directors, then offered a toast to Wireless, which was replied to by Mr. C. P. Edwards, radio chief of the Canadian Government's Department of Marine & Fisheries. Now be it known that Mr. Edwards is the "Terrell" of the Dominion and heartily liked by every ham. He is a peach of a scout (gave us a good drink, by the way), thoroly on to his job, and it's no wonder amateur radio runs smoothly in Canada. Mr. Edwards told his audience that majority rule governed and that they should be careful not to interfere with bumb-bell listening but help instead. It is the policy of his department to make as few actual regulations as possible, permitting the amateur to govern himself within his bands. New regulations had just been made for Canadian amateur radio a few days previously and Mr. Edwards made the first official announcement during his talk. Sparks get the wave of 175 meters, and no other. "That means," Mr. Edwards said, "that the spark has gone on a decline." The C.W. men applauded and the spark advocates booed and hissed their mightiest, but all in good fun. C.W. was permitted specific wave-lengths of 150, 175, 200,

and 225; power limited to $\frac{1}{4}$ K.W.; experimental "9"-licenses, 275 meters. Provision is also made for an amateur broadcasting license, to be used especially in localities where there are no broadcasting stations, wave length 250 meters. This class of license is to be issued only to duly organized associations, transferable by the club to any member thereof and good for operation during such hours as the club may determine. By this process the community is permitted to govern itself and there must be agreement. Public broadcasting continues on 400 to 450 meters as present. Mr. Edwards urged consideration in listening as well as receiving and solicited membership in his "Society for the Suppression of Useless Canaries." We picked up a good Canadian slang term from him, too: "P.B.O."—poor bloody operator!

Mr. Galbraith, of the locals, welcomed the visitors and proposed a toast to the Yanks—"for they are jolly good fellows!" Let us tell you chaps who weren't there that there is no such thing as a boundary line between these States and the Dominion!

Then followed Chas. Taylor of Buffalo, presenting to the convention the greetings of the Radio Assn. of Western N. Y.; a few words by 2FP and his gang, who had driven up; some from Ross of WHAM and 8AMQ on how it feels to run a broadcasting station; and an outline of conditions in Quebec by Mr. Wiggs of Quebec city. "Big Bill" Gray, of Chatham, complained of the temperature and wondered how it was that a radio fan wasn't automatically cool; and told of the interesting radio club they have in Chatham in connection with their industrial school.

Mr. W. C. C. Duncan, former president of the W. A. O. O. and a director in our A.R.R.L., told the gang that as a director he saw the inside of the League and knew that it was right, pointed out that the real interest in the game lies in relaying, and expressed the pleasure of the association at the better understanding between Canadian and U. S. amateurs certain to result from this convention and because of their joint membership in the A.R.R.L. And then Mr. Duncan offered a toast to the League, and right heartily it went down. Traffic Manager Schnell replied, incidentally announcing the plans for the forthcoming Transatlantic Tests, which were greeted with enthusiasm. In between, the Toastmaster called upon A.R.R.L. Secretary Warner to show off his English top-piece, the famous trophy of last year's Transatlantics. This was the first public exhibition of the London Lid, and we are sure we looked very sweet in it.

This banquet was a real one, the talks
(Concluded on next page)



LAST CALL!

Have you been doing your very derndest in our Sub Contest? If you have you'll have some mighty nice apparatus coming to you for we have known right along that it was easy to corral the subs if you tried even half-way. If you haven't, it's time you shook a punky sock, for this contest ends on November 10th and this is a last call to action.

You contestants have been getting regular bulletins from me showing your respective standings, so there's no use taking up space in QST for that. I have a chance in this space, however, to give you a final warning that things are coming to a show-down soon, and to urge you to put in your best licks in these final days. You can't tell how many subs some of these birds have salted away; in fact, I'm morally certain somebody is holding out on me. One thing is certain: the subscriptions are there for the asking.

When this reaches you there will be about ten days left in the contest. Ten more days in which to garner in a few signatures and let QST have the pleasure of fitting you up for the Transatlantics. This thing is going to have a whirlwind climax, fellows, and it's going to take determined effort to win; there's no doubt about that. It is worth your very best endeavor, however, and I earnestly urge

THE CANADIAN CONVENTION

(Concluded from preceding page)

were interesting, the atmosphere inspiring, and the whole thing was over by about 10 o'clock—which shows that it can be done. The usual informal post-mortem then convened, during which arrangements were made for a Boiled Owl's Party the following week, and then most of the bunch drifted out to get on the air at various Toronto stations.

8TT and 8AWX bummed their way up from Ohio by various autos and made the round trip for a total of 8¢ each. Even they got their money's worth, for the Wireless Association of Ontario may well feel proud of the splendid job it did in the First Canadian National Radio Convention.

K.B.W.

you to whoop 'er up and show some real speed. Remember that the prizes are real ones, liberal, and well worth spending all your time these last few days in the business of getting subscriptions for our QST. It looks like some of the smaller prizes aren't going to be qualified for and even now there is a good chance for a really energetic chap to jump in and pick off something worth while. If you want in on it, take in the subscriptions and wire me for blanks.

One final word: don't forget to mail in all your subscriptions by November 10th—they don't count after that.

Here's the ohm-saw; cut out that resistance and show some radiation!

THE CONTEST MANAGER.

That Relay to Hawaii

IN our September issue we reported a relay during July from 1AW to 6ZAC and remarked about the unusual accomplishment of slipping this unheralded message so easily across the continent in a time of bad static and difficult transmission. At that time no information was available on the route followed by the message but reports received in response to our request show a history about as follows:

The message left Hartford on the night of July 1st, to 1AWB in Woodbridge, Conn., who early the next morning, July 2d, gave it to 8SP in Fairmont, W. Va. At 1:55 the same morning 8SP gave it to 9UU in Chicago, who QSR'd to 9BSG in Ames, Iowa, who passed it on to 9AMB in Denver. The message was on the hook at 5ZA, Roswell, N.M., on the night of July 3d. 5ZA raised 6AEH in San Diego (one 5-watter) and tried several times to give him the message but was unable to get any QSL. 6AEH, however, had copied it OK and forwarded it to 6EN in Los Angeles; just when, however, we do not know. 6EN was up in the mountains on a camping trip on the night of July 3d, and of course had a receiving set. He copied the message direct from 5ZA, broke camp, and hurried home to QSR. Sometime about then he got the message from 6AEH also. It was in

QSR'ing to 6EX that 6EN was over-heard by 6ZAC in Hawaii, who thereby received the message at 7:44 P.M. Hawaiian time on July 7th.

There is still one gap in the story: 6AEH

and 6EN had the message on the night of July 3d but it was not until July 7th that 6EN was overheard QSR'ing. Where was it the intervening four days?

K.B.W.

A Radiophone Job in China

ROBERT F. GOWEN of 2XX, Ossining, N. Y., former chief engineer of the deForest company, has but recently returned from a most interesting 40,000-mile trip around the world during which he spent five months in China in radio work. American amateur skill stood him in good stead and he had some fascinating experiences in China which will undoubtedly interest our readers.

years behind the times where modern methods are not known, with no tools, among a people generally illiterate. But the stations are up, the school's text-book is written, and the students are learning.

Bob was married in Ossining in early October of last year and left for China on the same day, with his bride, as the engineer of a large American firm operating in China. Arriving at Hong Kong he re-



Commencement Day and the graduating class, the school and members of the Radio Communication Dept. of the province, with staff officers sent by the Governor for the occasion. The ladies are Mrs. Gowen and Mrs. Chung, wife of the Director of Communications, who, as a special courtesy to Mrs. Gowen, came to act as hostess altho she speaks not a word of English.

We are indebted to Mr. Gowen for the illustrations of his valuable "souvenirs," and to the Ossining *Citizen-Sentinel*, from whose story of his trip most of this account is abstracted.

Mr. Gowen has installed the first working phones in China, created their first radio school, and has seen the first class graduated. This in a country a thousand

ceived orders to proceed to Canton to install eighteen phone stations for the governor of the province of Kwang Tung. In the States this would have been a child's play, but remember that this was China.

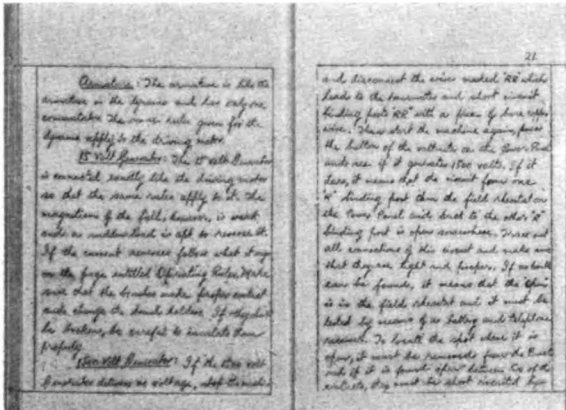
In the first place, these sets had a history. Radio was first introduced into this part of China by the Germans about ten years ago. They installed some spark

sets of a type now obsolete and succeeded after a fashion in teaching some native operators. These chappies received the munificent compensation of \$8 per month, and the coolie workmen who kept up the sets rejoiced in the reception of \$2 for the same period. About three years ago the

the sets were almost hopeless and conditions were much more so. Enters Gowen, with orders to install the eighteen sets at eighteen different points. He found the sets covered with an inch of mold and the metallic parts corroded, no tools of any kind to work with and no trained workmen.

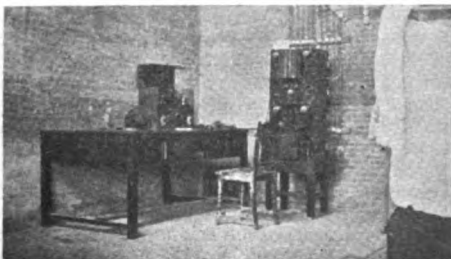
The only bright spot was also a new arrival in China, a former U.S. navy radio man. Him Gowen seized as assistant and set to work. They corralled the Chinese "mechanics," showed them how to scrape metal and clean insulation, and before Christmas four of the stations were installed and operating.

After Christmas the government ran short of money, a chronic condition of Chinese governments. They decided they could do the job themselves with their \$2-a-month labor and took over the contract from the American company, and darned if they didn't engage Gowen as consulting engineer and technical advisor to the governor, with pay in advance. From then on he was virtually an official of the China Government, enjoying all official prerogatives and carry-



Typical pages in the English version of the school text-book.

province of Kwang Sie, which adjoins Kwang Tung, purchased eighteen deForest radiophones. Now our conception of the Chinaman is based largely on our acquaintance with our laundryman and he seems a cheerful good-natured fellow. They don't all seem to be that way, however, for it happens that Kwang Tung declared war on Kwang Sie and part of the spoils were these eighteen phone sets. They were considered a valuable capture but there is no particular hurry about anything in China, so they were stored in a damp cellar and left to shift for themselves. A year before Gowen arrived a San Francisco engineer had spent many months trying to get things going and gave up in disgust—



The finished radio station at Shui Chow, "SW."

ing credentials admitting him to all government departments and an imposing document which upon presentation required the head official of any town to provide him with an armed guard. The only bad feature about this was that the soldiers were nearly as dangerous as the bandits they were supposed to protect his party from.

Well, the government wanted more stations built but Mr. Gowen balked. He had no trained men to do the work but offered as an alternative to train the Chinese in the work so they could do it themselves. A school was started. Now trying to put up stations is one matter but running a

Chinese school is still another. First he had to have a text-book. There weren't any, so Gowen wrote one! In English it filled 200 pages. Then he had his interpreter, a bright Chinese lad who had learned

being necessary several times before the demodulation sounded like the original. By that time the text-book was right down to ten-year-old stuff, but that was what was needed. Then the books were mimeographed and copies prepared for the students. There were thirty of them, including the director and assistant director of radio communication of the province. For two



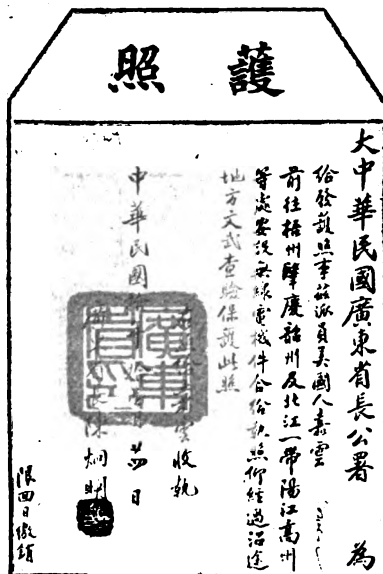
Autographed photograph of His Exc., Chung Kwing Ming, governor of Kwang-Tung, now self-appointed president of the Republic of China, presented to Gowen on his departure, April 3d.

English in Hong Kong high school, translate all but the drawings into Chinese. He knew nothing of radio and none of the technical terms, even in English. The technical terms in fact are not capable of translation, as there are no equivalent words in Chinese. Nevertheless the in-



The Dept. of Radio Communications, Republic of China. Gowen's office and school room on the second floor.

terpreter tackled the job, and then read it back in English to Gowen. His English-to-Chinese-to-English had considerable distortion in process and Gowen changed the language to make it simpler, this procedure



This important-looking document is one which on presentation to any village magistrate ordered that he furnish Gowen with a guard of soldiers as an escort for protection from bandits.

hours every morning Gowen would lecture thru an interpreter. It was tough work. He got about as much response out of his class as from a brick wall. He would speak; the interpreter sing-sang what he guessed to be its Chinese equivalent; the thirty scholars quietly listened with in-expressive faces. He instructed his students to keep note books in Chinese; they would listen all day and were eager to learn but they balked at doing any work, and likewise at examinations, claiming they weren't paid enough to bother with exams. But eventually they came around to it and with all these handicaps a good part of the students did learn about radio. Before Gowen left they had a complete station of their own construction set up and running.

Telephony of course is the only thing possible with the Chinese language; it defies telegraphing. The alphabet has many thousands of characters and many of these have multitudinous meanings. For ex-

ample, the translation of Mr. Gowen's name in Chinese is "Gow Hen," the component words of which mean, literally, "Glorious Cloud." There are nine different ways of pronouncing "Gow" and each one gives the word a separate meaning. For names of wireless parts it was necessary to have the Chinese learn the English names. "Armature," for instance, can be translated into Chinese no better than as "ball of wire," and coils and inductances would have to be translated by the same term. Learning the English name was the only solution.

The Gowens found living conditions surprisingly fine and a splendid "foreign" quarter where they enjoyed an apartment fitted with American furniture, had six

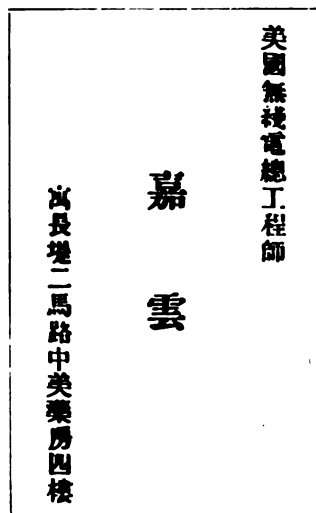


An autographed photograph of Director of Radio Communications, Chung Yuk Hang. Note the very choice pose.

servants, and a chef serving American food who knew how to cook. At Christmas the American colony had a Christmas Tree and everything. They found the Chinese hospitable and appreciative; they showered Gowen with honors and when he left, at the graduation of the first class, the students of his school presented him with a beautiful silver vase with a touching testimonial engraved thereon. Official honors were paid too, and the governor of the province, Gen. Chung Quing Ming, now president of South China, gave Gowen an audience and presented him with an autographed photograph of himself.

Returning via Singapore, Calcutta, Bombay, Egypt, Italy, France and England,

A Chinese radiogram blank, a huge sheet $9\frac{1}{4} \times 13\frac{1}{2}$ inches. This photo is a copy of the first message sent from Shui Chow, a message of felicitations to His Excellency Chan Quing Ming, governor of Kwang Tung Province.



Gowen's business card. Reading down the columns, the words are, first column: Live Near Bund Second Horse-Road (street) Chinese American Medicine Company Fourth Floor. Second column: Glorious Cloud (i. e., Gow Hen, the nearest Chinese approach to Gowen). Third column: American Country less Wire Telegraph Chief Work Task (engineer) Teacher.

Gowen in 40,000 miles met but two persons he had ever seen before and these, by a strange coincidence, were the Duncan Sisters, playing at a London theatre. The Duncan Sisters, it will be remembered, were the performers at the very first radio

vaudeville broadcasting ever staged in America, which took place from Mr. Gowen's station, 2XX, in March of last year.

K.B.W.

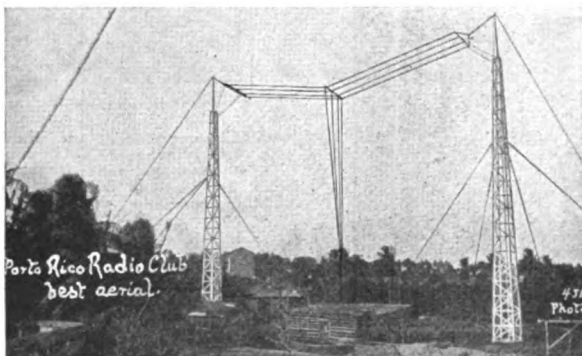
QSO Porto Rico

PORTO RICO has put itself on the amateur map and A.R.R.L. traffic between that island and our South Atlantic coast is moving every night! This is another glorious accomplishment in amateur radio, the credit for which is shared by the A.R.R.L. Roanoke Division and the Porto Rico Radio Club, affiliated. Bravo, gang!

that 4BX gave it to 1QP, in which process it was intercepted by Traffic Manager Schnell. A reply was filed at 1QP on the evening of the 22d reading as follows:

*Porto Rico Radio Club
San Juan, Porto Rico.*

Your message received Sincere congratulations on the establishment of amateur com-



40I's beautiful aerial, best on the Island

40I, in Martin Pena, is the Porto Rican terminal and 4FT and 4BX, by a coincidence both in Wilmington, N. C., the QSO stations on the mainland, the intervening distance being about 1300 miles. Communication was first established between 4FT and 40I on Sept. 15th, and at this writing something over forty regular messages have been handled, with almost nightly communication. Meanwhile 40I was reporting 4BX very QSA too, and this additional link was opened on Sept. 23d when 4BX found 40I.

On Sept. 16th 40I gave 4FT a message for Hartford reading as follows:

*Nr 1 fm San Juan, Porto Rico
Amer Radio Relay League
Hartford Conn.*

*Greetings from the Porto Rico Radio Club
upon inauguration of traffic with us.*

J Agusty President

Apparently this message suffered delay in Wilmington, for it was not until the 21st

munication with the mainland May it be permanent.

*A R R L Headquarters
Maxim Warner and Schnell*

At 9:48 P.M. on the 22nd 1QP gave this to 3AQR, who QSR'd to 4FT at 9:54. 4FT passed it across town to 4BX who worked 40I that night and at 11:15 the message was delivered in Porto Rico.

We are indebted to Mr. Joaquin Agusty, president of the Porto Rico Radio Club, for photographs and particulars on 40I. This station is owned by Mr. Luis Rexach and boasts the finest aerial on the island, a 4-wire flat-top "T" on 105-ft. towers, with a perfect radial ground of heavy copper ribbon below the antenna and buried 3 ft. deep in wet ground. The station is only 50 ft. from the sea. 40I uses two 50-watt bottles and gets 4 amps. in this antenna.

Mr. Rexach has made remarkable progress in radio. Only a few months ago he

was a beginner, with a Ford coil. So great was his interest that he learned the code and got a license in three months, and now he is the first to establish DX traffic connections with the mainland. His wife and small son, Master Luis Rexach, jr., the latter incidentally the club's mascot

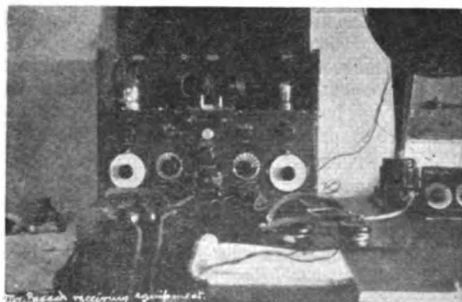


40I Junior, Master Luis Rexach, the club's mascot

and the youngest ham on the Island, share his joy in radio work.

4BX is the station of G. S. Smith, the well-known City Manager of Wilmington, and puts 3½ amps. in the antenna from three 5-watters. Current call-books show 4FT as Atlanta but this is incorrect, the call having been reassigned on Aug. 15th to Donald McR. Parsley, also in Wilmington. 4FT's signals are most consistent at 40I, as attested by the kick with which the latter acknowledges, but he is badly handicapped for power, getting 1½ amp. in the aerial from a 15-watt set supplied by a 32v.-500v. dynamotor operating on a farm lighting outfit. It is worthy of note that Wilmington is one of the nearest cities on the mainland to San Juan.

Mr. C. A. Service, jr., Assistant A.R.R.L.

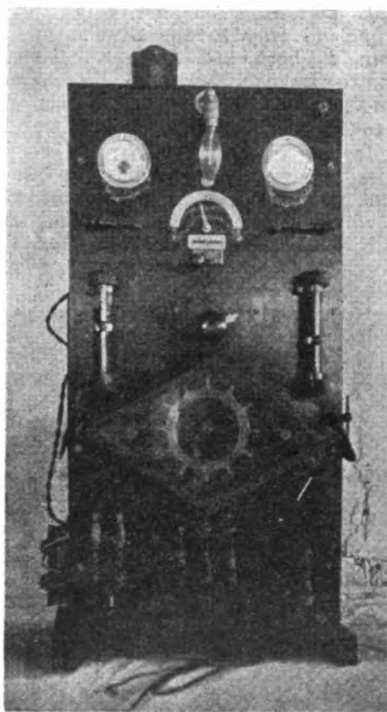


40I's receiver

Secretary, while on a vacation in Nova Scotia, heard 40I consistently all during the evening of Sept. 21st, a distance of some 1800 miles but all over water.

Mr. Agusty, mentioned previously as the president of the Island club, writes us as follows:

"Radio is going fast in Porto Rico. Everybody has the fever and a simple explanation will help. On the 25th of December, 1921, at a meeting in the Carnegie Library here the Porto Rico Radio Club was born. To-day we are officially affiliated with the A.R.R.L. We have 302 members, three-quarters of whom are studying radio thru the Club's free course. There are six transmitting licenses now: 4JE, 4LG, 4KT, 4KS, 4JV, 4DA and 40I. Mr. Pinero (4KT) installed the first radiophone and C.W. set and Mr. Rexach of 40I has established communication with the States.



4JE's old spark transmitter, the first amateur set in P. R.

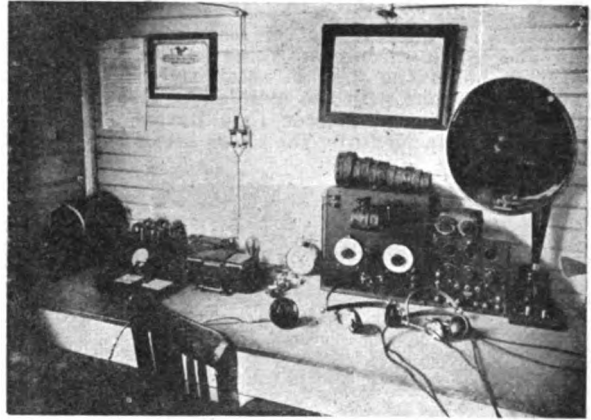
We are here for radio. Soon we will accept traffic for South America and soon we will send some for 6ZAC in Hawaii. We must say that Mr. E. C. Stephens, director of the Escuela Hispano Americana de Radiotelegrafia, is doing much to help radio in Porto Rico. He is publishing "Radio," a magazine in Spanish.

"The Porto Rico Radio Club sends greetings to all amateurs in the United States and will QRX for traffic, even for South America when this route becomes open. Any inquiries should be sent to Box 868, San Juan, P. R."

Mr. Agusty, 4JE, is the father of amateur radio in Porto Rico. Thru his kind-

ness we present views of his excellent receiving set, home-built, and of his old spark transmitter, the first on the Island. The receiver employs honeycomb coils and is a "universal," POZ and LCM being copied regularly on the long waves and the reception of 9RT very QSA being cited as proof of its efficiency on short waves. The transmitter is a $\frac{1}{2}$ k.w. spark with enclosed non-synchronous rotary gap, rheostats to control gap speed and transformer input, and control for three wave lengths, 150, 175 and 200 meters. This set will soon find its way to the Club's museum, as both 4JE and 4KT expect to have 100-watt C.W. sets in operation by December.

Porto Rico is directly in line for relaying to South America and the amateurs there will play an important part in the international relay work which is certain to develop. Soon our A.R.R.L. may have to establish a West



4KT (20 watt phone) at Carolina, P. R.

Prevention of Sparking at Key Contacts

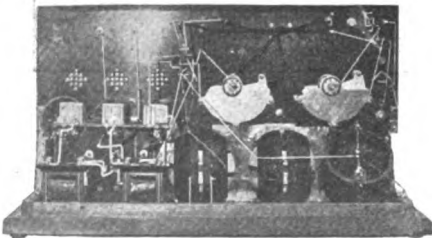
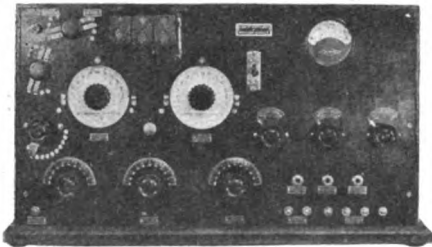
By H. P. Corwith, 2BRC

I BELIEVE that the best position for the key in C.W. work is in the plate circuit. Trouble is often experienced, however from sparking and arcing. If the contacts are shunted with a condenser the trouble from arcing is cured, especially where a D.C. supply is used. However, the sparking is still bad if not worse, as it takes the form of a harsh click which burns the key contacts badly. If, however, a capacity and a resistance in series are shunted across the key contacts, the sparking will almost entirely disappear if the resistance and capacity are properly chosen.

The action may be likened to that of springs and snubbers on a car. The condenser absorbs the shocks like the spring and the resistance acts as a snubber to slow the spring action down or it may be likened to a dash-pot effect.

I haven't experimented much with condenser values at 2BRC but found that a 2-mfd. condenser was apparently too large. Accordingly, Dubilier type 277 of 0.01 mfd. capacity was chosen with a resistance of 100 ohms in series. On breaking a plate voltage of 500 V. D.C. and 200 mils, the sparking is hardly noticeable.

A suggested method for finding the proper resistance is to note the character of the sparking at the contacts. If the spark is snappy, the resistance is too small; if it is mushy and inclined to arc the resistance is too large, the proper value lying somewhere between these limits.



An example of P. R. amateur construction—Mr. Agusty's receiving set.

Indian Division! Meanwhile route your Porto Rican traffic into the old Roanoke Division for QSR.

Hats off, fellows! Three big cheers for the Porto Rico Radio Club and the Roanoke Division!

K.B.W.

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Hi!

RADIO NEWS says we're DOOMED, fellows! In one of the characteristic articles for which it has attained its unenviable reputation, our A.R.R.L. death-knell is sounded. From what we have been receiving in the mail, we should say that most of you fellows had either read the two "obituaries" or at least had heard about them. We usually are inclined to let these yellow efforts pass unnoticed. In this case, however, it is a little more extravagant than usual, and if it does not rub you the wrong way it makes you smile.

Of course there is the usual big dollar-sign hanging in the back-ground. The contributor is obviously influenced by the amount of space he can fill, and the editorial is obviously influenced by the \$500 prize contest. It seems too bad that New York should have so much of this sort of thing, and that New York people, at least a certain kind of New York people, are so blind to the effect of their transparent efforts upon the people in the rest of the country.

"The amateur is doomed unless something is done to get him out of the present rut."

Who does this sound like, fellows? If you read it in South America, you would know instantly who wrote it. The "rut" is our A.R.R.L., of course. We are all wrong, and so deep down in a "rut" that we cannot see out over the top. We ought to be stringing antenna wire, explaining static, and showing how to get selectivity on a single-circuit tuner for the benefit of our neighbor across the street, who happens for the moment to think he is interested in radio. We are criticised for developing organization, encouraging good-will, and struggling to secure orderly operating and efficient two-way communication on short waves. Think of it!

Here is another sample, which it really is hard to believe actually was put into print:

"The amateur to-day is not recognized in the community."

Can you beat that—much! Those bales of newspaper clippings about our Transatlantics, the fact that we were mentioned in every single newspaper printed in the United States and nearly every magazine,

and that in many places we have intimate working arrangements with the police departments of the cities, and that some of us are actual police officers, sworn in and wearing badges, and that we are soon to be Federal Deputy Radio Inspectors, is lightly brushed aside by a wave of the hand. To those of us who heard what Secretary of Commerce Hoover had to say about us, what the Navy Department had to say about us, what the Congressmen and Senators had to say about us, during the recent radio commission conference in Washington, it certainly must be edifying to read that we are "*not recognized in the community.*" Really, you know, it is funny, especially when we recall the letter a certain person wrote to Washington asking to be appointed upon the Radio Commission, and the answer he got back, which was to the effect that Mr. Maxim, President of the A.R.R.L., would adequately represent the amateurs of the country.

Here is another choice morsel taken from *Radio News*:

"There is to-day no real purpose for the radio amateur."

Let's see you match that, even in the political world, where the facts usually do not cut any very astonishing figure. Is it any wonder that the person who would write such things gets the treatment he does at most of our radio conventions? Every amateur must wince over these things. Certainly, "twere better left unsaid."

How does this one strike you, taken from this same article:

"We wish to state right here that we have no axe to grind. . . . What we wish therefore, fellow amateurs (the nerve of him), is a manuscript of not more than 1000 words, setting forth your idea as to the best plan to put the radio amateurs on a solid footing. . . . This contest will close in New York, November 15, 1922, and the prize winners will be announced in the January 1923 issue of Radio News. Address all manuscripts to Editor, \$500 Amateur Prize Contest, care of this publication."

They used to say, "Butchered for a Roman holiday." You might say to-day, "Butchered for a Fulton Street holiday."

It certainly is to smile, when the facts are that our Board of Direction went all

over this matter, spending weeks upon it, as a result of the suggestion of Paul Godley, which he made the night we gave him the Goodbye Dinner in 1921, just before he sailed for England on last year's Transatlantics. We see in fancy the faces of our good old Board of Direction as they read this—and we end as we began—HI!
W.M.S.

The Voluntary Lid

AS a result of experience thru the past year of broadcasting, we have a definite program to recommend for amateur consideration. There have been many unjustified complaints against amateur QRM and of course where amateurs in cities have hogged the air all evening there have been justifiable complaints. Most of us have realized that broadcasting was capable of becoming a powerful force for good in our country, of tremendous social, economic and educational value, and have known that meant the passing of the old days when we could pound brass from supper-time on and the ushering in of a new era when the air had to be shared. As we have pointed out previously, many of us have gone so far in the business of sharing that we have almost been afraid to operate at any time, and amateur radio has suffered for the lack of a definite plan. On the other hand there are uninformed novice listeners who object to amateur transmission at any hour of night, and again the need for a recognized scheme has been shown. This we now offer.

Broadcasting is admittedly an institution of the early evening hours. That is the time that quiet air should prevail, when the greatest good can be done for the greatest number. When should we open up our stations for transmission? Our Board has considered that question and has decided upon 10:30 P.M. as the proper time. We're regretfully obliged to conclude, fellows, that the time is here when we should voluntarily keep our transmitters silent during the early evening hours if their operation interferes with listening. This means that in all congested communities amateur stations should be quiet between the hours of 7 P.M. and 10:30 P.M. This is no new thing for most of us—we've been doing it already—but it makes it a recognized principle of amateur work.

We urge our members and clubs to get together with the listening-in element in their community and have an understanding on the subject. Acceptance of this plan on the part of the amateurs means that they recognize the rights of the listeners to hear their concerts undisturbed, and that they will keep quiet between these hours. Acceptance of this plan by the novice listeners means that they recognize the rights of us amateurs to transmit and

carry on our useful work and that they will not complain against the "meaningless buzzes" when the lid goes off at 10:30. This plan was proposed at a meeting of all radio people in Rochester recently and was adopted as a solution of the local difficulty. We may well call it "the Rochester Plan."

Whenever a community gets together and agrees upon such a plan, we feel that it should become as law and that the mere possession of a transmitting license should not entitle an amateur to go contrary to the sentiment of all his fellows. It is our view that such operation, unless justified by an emergency or official tests, would constitute deliberate and malicious interference within the meaning of the federal radio law, and we believe the Department of Commerce will agree with us. On the other hand, in localities where this plan is adopted and quiet air is maintained between 7 and 10:30 P.M., we will expect amateur transmission to proceed without complaint after 10:30, and the A.R.R.L. will protect with every resource at its command the right of any of its members to so transmit if unjustly accused while legally operating in such a community.

Now we have a working plan. Let us adopt it, fellow amateurs. This puts an important duty of self-policing on the shoulders of our affiliated clubs and we are depending upon them to handle the job. When this plan is adopted it must be respected, religiously, and this means that unlicensed and improperly adjusted stations must be hunted down and turned in. In bygone days such a station bothered no-one but its neighborhood amateurs, and if they could put up with it there was no harm done; but to-day such a station will bring discredit upon all of amateur radio and must not be permitted to exist. We would suggest that clubs establish committees to help local amateurs and render assistance when needed to get a station properly adjusted, but if the operator persists in operating illegally after being warned he should be turned in to the inspector without mercy—we have too much at stake. Other folks are watching us too, and while we think about it we want to tip off everybody to get their station and operator licenses renewed promptly upon expiration.

What about local work, which used to occur in the early hours of the evening? Honestly, we don't know, and it will be up to the amateurs of each club to decide for themselves how they will divide their hours. The time after 10:30 is going to be very precious and, solely because it is not as important as DX work, we are afraid local work will have to be got over with by the time 7 o'clock rolls around. Low-powered battery-operated C.W. sets of course can be used for local work all evening long and not cause a particle of QRM for the broad-

casting fan next door, but most of the lads who do local work have a far different kind of equipment—**hi!**

Our transmitters must improve. There will be too many of us with traffic to move at 10:30 and too many listeners with dumb-bell tuners for us to continue much longer with the cycle-consuming spark of pre-war days. For the very efficiency of our traffic moving the selfish spark will have to yield to the valve set. We hasten to say, though, that there are selfish C.W. sets too, and we are just as much agin a bum C.W. without rectifiers and filters as we are against the ordinary spark, and for exactly the same reason—it takes up too big a place in the air, its wave is too broad. We cannot be pushed into an adoption of C.W. versus spark against our will, but left to our own devices we believe it is evident to any thinking amateur that the quiet efficiency of the little bottles is just the thing we need—filtered D.C. C.W. transmitters.

Now let's get busy on our self-imposed 10:30 lid. Remember that the League does not feel that it can back a member who runs loco in a congested locality and smears a whole county with QRM from the minute his supper is down, but that it will safeguard the interests of its law-abiding members in communities where the Rochester Plan is adopted and *respected*.

One thing more. Noise this about a bit. Let it be known that we amateurs have decided among ourselves to preserve some quiet hours, out of consideration for the broadcast listeners. Spread a little honest propaganda in your local newspapers.

K.B.W.

The December Transatlantics

NOW for a happy subject—our coming transatlantic tests! Doesn't the very mention make you thrill to the possibilities of achievement? Here is one of the big classics of amateur radio, one of the things that make the game worth while, an opportunity to show what your station can do. Things have whizzed in amateur work this summer and early fall and the A.R.R.L. has cut another half-dozen notches in its Wouff-Hong, but in December comes the *creme de creme*, the chance for the real DX-hound to show his mettle in both reception and transmission.

The Britons won't need help this year but the amateurs in France, Holland, Italy, Finland, Australia, China, Hawaii, and numerous points in South America and the West Indies will be observing our tests and helping in the reception. This is an unrivaled opportunity to make a distance record for your transmitter. Can any further inducement be offered?

But we're also listening ten nights this year, like the British amateurs did last year. How good are we in reception?

Present indications are that there will be several high-powered C.W. stations entered in the contest in both England and France. Fellows, we must not fail—we simply *must* copy signals. If we don't the British amateurs will be sending over one of their chappies next year with their best gear, to show us how to do it! We've had excellent articles in *QST* during the past year on every phase of receiving, tuners, radio amplifiers, supers, heterodynes, etc., and in this issue we wind up the job by presenting the first authoritative information given the world on the wave antenna for short waves. Surely we have everything we need. "Let us then be up and doing!"

Two matters of co-operation remain to be handled. The first one concerns only ourselves. We must have absolutely quiet air during our reception tests. We must not let a lack of co-operation among ourselves mar our chances for success, we who boast so of our co-operative spirit. Prepare right now to keep your station silent during the listening hours when British and French amateurs are transmitting, unless you want to go down to posterity as the poor fish who gummed America's chances in the tests. And help the uninformed amateurs outside our A.R.R.L. who do not know of the tests, as they will be glad to co-operate and participate in the reception effort. The other matter concerns the broadcast listeners who unfortunately are going to be considerably bothered during our ten-day transmission periods, both in the preliminaries and the finals. We believe that they will appreciate a frank explanation of what all the hubbub is about and we would suggest that it be given them, with the assurance that it isn't a regular feature, so that they may understand how a thing so at variance with our 10:30 plan could happen.

Do we copy Europe?

K.B.W.

The Roanoke

DOWN in old Virginia there is a real A.R.R.L. division, a bunch of regular fellows, some sure-enough stations, and very considerable of the *esprit de corps* that has made our organization what it is. Quietly, efficiently, without trumpets and without ostentation, the fellows there have built, solidly and for the future.

A year ago the Roanoke Division was a baby, possessing no spirit of its own, running near the cellar position in A.R.R.L. work. In recent months its progress has been absolutely wonderful. The division has a network of quiet C.W. stations which handle traffic with machine precision and the message totals have been rolling bigger every month. There is but one DX-spark station in the division. The whole outfit

(Concluded on page 66)

AMATEUR RADIO
I feel 'em!



INTERNATIONAL Amateur Radio

Transatlantic Observers Wanted

As announced in this and previous issues of *QST*, a third series of Transatlantic Tests will be held this coming December between United States and Canadian amateurs on this side, and British and French amateurs on the other, with Holland and Italian amateurs listening. Transmission tests will be arranged in both directions across the ocean.

This item in *QST* will be read by qualified amateurs in every country—Iceland, South Africa, Japan and China, Argentina, Hawaii, Uruguay, the Philippines, Finland, Syria, Australia, everywhere. We wish to urge such readers to listen in on the tests. Amateur short wave signals have an amazing facility for covering unexpected distances and will have no doubt that during these tests amateur signals of some sort can be heard anywhere on the face of the earth. *QST* readers in other countries are cordially invited to get their receiving gear in operation and endeavor to pick up some of the test signals, reporting their results to the League offices at Hartford, Conn.

Holland Letter

Mr. K. F. M. Kunen, First Secretary of the *Nederlandsche Vereeniging voor Radiotelegrafie* (Holland Radiotelegraphy Society), has kindly consented to write monthly letters on amateur activity in the Netherlands for *QST* readers.



Mr. Kunen

We take pleasure in presenting his first communication:

"On the request of the editor I'm going to tell monthly something about the position over here, and I hope our American colleagues will take an interest in our doings.

"First I want to ask you

American amateurs if you really know what 'Liberty' is? I tell you no, because you are

living in the land of liberty and with some restrictions about wave-length and knowledge you can work as you like. Over here, where only receiving is allowed, you ask a license of the Postmaster (manager of the government telegraph office) who signs the license and after some time comes to see your set. As to sending, all kinds of requests have been sent to our Ministers of Waterworks but they have all refused to grant a license. Last year our Association, with about 2000 members, sent a request and were answered that as at the present it is even very difficult to assure the secrecy of public correspondence by the unlimited licenses of receiving sets, the free working of amateur stations could not be allowed. So it is forbidden now and . . . we don't send at all.

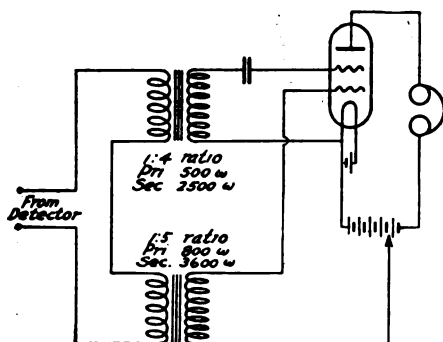
"I cannot feel that the situation has been well handled. The government says it is impossible but the right way would have been to follow the practice in the States where the government asks the advice of experts and the opinion of the amateurs. As yet this has never taken place in Holland but we still hope that we may get rid of persons suffering from littleness of mind and have them replaced by well-acquainted radio experts. Numerous examples can be given to show that permits could be given for transmission but nothing helps; the government forbids, so we must keep quiet. From this you will see, dear colleagues over there, that our position is anything but agreeable.

"An exception is made for dealers and manufacturers, who are allowed on certain hours to give radiophone concerts. Perhaps you have heard of our famous PCGG, the *Nederlandsche Radioindustrie* at The Hague, whose concerts are also heard in England. He gives his concerts every Thursday and Sunday night from 7 to 8 Greenwich Time for the *Daily Mail* and their readers in the United Kingdom, and even replies to letters received by means of his phone, and is heard well in England.

"Many of the amateurs are satisfied with the hearing of concerts and there are many among them not acquainted with the Morse code, which is the way that should be followed by a real amateur. Concerts from

the amateur viewpoint must be considered as an affectation, the cardinal points being training in the code, the studying of diagrams, and the operation of the apparatus. It is true that trying to get good reception of music leads to perfection of the apparatus and it must be said that good results have been obtained, but the right way of working the apparatus has not; for it is not difficult to get strong signals when much amplification is used but tuning well and getting good signals when only two audions, one as detector and the other as high-frequency amplifier, are used is a good test.

"Many amateurs here use the double-grid audions in all kinds of circuits. In Holland different makes of such bulbs are available such as the Siemens-Schottky, well known on account of its low price, the Heussen, etc. In the September issue



of our magazine, *Radio Nieuws*, Mr. J. Corver published the diagram shown herewith where he used a Heussen double-grid. In this circuit the effect depended on the transformer used and different results were obtained by testing various kinds of audions with the same transformer.

"We are working here at full strength for the radio exhibition which starts on Nov. 17th, where both amateur and manufactured work will be shown.

"A few words about our radio station in our East Indies, at Malabar near Bandoeng, no doubt often heard in America. In the end of July the new engine-sender [high-speed automatic transmitter?—Ed] of Telefunken make was set into action for tests. Recently when the new aerial was being hoisted one of the cables broke and fell among the natives; two were killed and five seriously injured. The service is troubled heavily.

"For this month I finish, and wish good success to the tryers and experimenters with the diagram given."

Kunen.

A ONE-TUBE SUPER-REGENERATOR

(Concluded from page 29)

light at distances in excess of 500 miles. The night range seems limited only by interference. Lists of calls heard and verification cards received were submitted by Mr. Groves but are not printed because of lack of space.]

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST, published monthly at Hartford, Conn., for October 1, 1922.

County of Hartford } ss.
State of Connecticut }

Before me a Notary Public in and for the State and county aforesaid personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 448, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of the individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock.) The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If they are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appeared upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustees is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

Sworn to and subscribed before me this 26th day of September, 1922.

K. B. Warner.

Wm. Lacey Wells, Notary Public
(My commission expires February 1, 1925.)

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



YES men, its too bad that this good old amateur radio game is dying as one of our foolish contemporaries says. But oh, what a happy death! Would that it die as much each month as it did last. It's a crime, fellows. Honestly we are dying away to the tune of 16,330 messages for this month as compared to 10,228 for last month. The huge crepe that our contemporaries see is nothing more or less than that big bubble of listeners which blinds them; but the amateur is in the back ground repos-

and we predict that the coming year will be the greatest year in the history of amateur radio. You know fellows, sometimes as we are compiling the message traffic report along the first of the month, we see just a few hundred messages and it looks like a dull month, when all of a sudden the postman brings us the message report for the Roanoke Division with a big total—it's a grand and glorious feeling! Those "ether combers" down in Grave-ly's Division are making things hum; no

Message Traffic Report By Divisions SEPTEMBER

Division	Stns.	C.W. Msgs.	M.P.S.	Stns.	SPARK Msgs.	M.P.S.	Stns.	TOTAL Msgs.	M.P.S.
Atlantic	46	1774	38	23	1108	48	69	2882	42
Central	42	2522	60	29	1530	52	71	4052	57
Dakota	17	721	41	2	21	11	19	742	39
Delta	6	92	15	6	154	25	12	243	20
East Gulf	20	826	41	5	130	26	25	956	38
Midwest	21	1040	50	10	255	26	31	1295	43
New England	22	1989	90	7	235	33	29	2224	76
Northwestern	10	195	19	15	419	27	25	614	24
Ontario	7	113	16	1	8	8	8	121	15
Pacific	12	207	17	7	106	15	19	313	16
Roanoke	38	2179	57	4	258	64	42	2437	58
Rocky Mtn.	8	391	39	5	64	13	13	455	35
Vancouver	2	18	9	6	85	14	8	103	13
West Gulf	22	441	20	13	186	14	35	627	18
Winnipeg	2	50	25	1	2	2	3	52	17
Total	329	12458	38	134	3872	28	463	16330	35

C.W. Messages, 12,458—76%
Spark Messages, 3,872—24%
Total 16,330

ing peacefully on a solid foundation and is carrying on as never before. Some folk have the idea that because the amateur is a co-operative sort of person who gave up his pleasure night after night just so the "new baby" could play with the funny little lamps, that he is dying. It is a noble death to die for another, but the amateur is not dead, nor is he even sick. On the other hand he has had a rest that will make him physically fit for the big problems which will be taken up this winter. True enough, we do burn a lot of midnight oil in conducting our affairs

wonder old man QRN has moved out. Gess it gets a bit too hot for him and even he with all his cunning couldn't stop 'em. Many congrats to you all. Why our poor little Roanoke Division only rolled up a total of 2437 messages as compared to 1615 for last month. 'tis a sad state of affairs when the total used to be in the neighborhood of four or five hundred for a good winter month. No sir! the poor lil' amateur hasn't done a thing. Of course we might mention that amateur radio communication was established with Porto Rico and on

one night a message started from A.R.R.L. Headquarters at 9:48 P.M. and landed in Porto Rico at 11:15 the same night, but what is that. Nothing at all, only it has not been done before. Now a route is open to Porto Rico via 4FT or 4BX. Nil desperandum!

50,000 Messages

That is going to be our aim for the business of one month. We will handle a total of 50,000 citizen messages during some one month before this season gives way to warmer weather and strong atmospheric. With the business of traffic handling starting not later than 10:30 P.M. our traffic will be moving regularly and consistently with despatch. To work men! Let's go after that mark with keys unrestrained.

The new directory of the Operating Department appears in the front of this issue and there you will find the name of I. Vermilya, 1ZE, given as manager of the New England Division, vice P. F. Robinson, who resigned because of business pressure. When W. D. Woods gave up the Vancouver Division to attend school in Seattle, J. T. North, Jr., was appointed in his place.

The traffic honors for this month go to a C.W. station.

 * Worcester County Radio Association *
 * 1BKQ *
 * Worcester, Mass. *
 * New England Division *
 * 472 messages *

TRAFFIC REPORT

Atlantic Division—C.W.: 2AEQ, 76; 2AVE, 23; 2AJF, 10; 2SQ, 3; 2ARS, 10; 2CBK, 5; 2FC, 24; 3CDK, 15; 3CG, 42; 2BQC, 8; 2BNZ, 105; 2ALY, 75; 2VA, 10; 2AFC, 48; 2CDR, 40; 8ASL, 16; 8ANJ, 38; 8BJY, 25; 3AGN, 4; 3BIT, 62; 3SM, 59; 3FS, 53; 3QV, 38; 3VW, 18; 3BNU, 122; 3ADX, 107; 3AWH, 20; 3ZO, 234; 3BTY, 43; 8ACF, 41; 8CKM, 17; 8AKW, 7; 8AIO, 43; 8BJX, 20; 8SE, 26; 8BRL, 10; 8LF, 7; 8AKW, 7; 8AJD, 30; 3WF, 21; 3SQ, 5; 3HG, 38; 3ALN, 87; 3IL, 22; 3LR, 12; 3ZW, 17; total, 1774. Spark: 2DI, 114; 2AEO, 34; 2PF, 33; 2BRB, 54; 2CJX, 28; 2BQZ, 20; 2SQ, 16; 2OM, 197; 2NF, 78; 2ARB, 48; 2CDR, 28; 8AXN, 57; 2WB, 150; 3QN, 4; 8ALF, 22; 8ZD, 81; 8EW, 63; 8BRL, 20; 8CEJ, 32; 8HY, 4; 3AC, 1; 3KM, 2; 3OK, 10; total, 1108.

Central Division—C.W.: 8FT, 247; 8ASZ, 213; 8IJ, 206; 8BWA, 143; 9BHD, 15; 9DQU, 75; 9APS, 114; 8BDO, 112; 8ZZ, 110; 9EI, 109; 8AB, 100; 8AM, 85; 8BEF, 85; 8ZAG, 68; 9AAP, 33; 8ANB, 54; 8DZ, 51; 8CAB, 46; 8CBX, 44; 8WI,

51; 8ZAF, 39; 8CGX, 41; 8BVR, 39; 9ALW, 12; 9CCN, 16; 8AIM, 37; 8CDZ, 33; 8ZF, 32; 8CAZ, 31; 9BLC, 28; 8CMI, 22; 8AWN, 19; 8AND, 17; 9AFN, 9; 9DCR, 10; 8CVM, 14; 9AWS, 6; 9YB, 6; 9ALR, 5; 8BAH, 4; 8BEP, 1; 9OX, 140; total, 2522. Spark: 9ZN, 215; 8ZO, 158; 8FT, 154; 9UH, 162; 9ACL, 25; 9MC, 19; 8AUX, 122; 8UC, 122; 8AIZ, 112; 8ZY, 98; 8BEP, 78; 9AZA, 35; 8BXC, 35; 9AFK, 30; 9BLU, 11; 8TK, 15; 8EB, 15; 8CMI, 14; 8WI, 9; 8TT, 8; 9DEL, 7; 9DXT, 5; 9YB, 5; 8ALK, 3; 9WX, 57; 8DZ, 3; 8ANB, 2; 8CUM, 2; 9OX, 9; total, 1530.

Dakota Division—C.W.: 9BAV, 8; 9CPV, 3; 9AGW, 2; 9EA, 7; 9BAF, 22; 9ZC, 8; 9DGE, 20; 9BJV, 117; 9DR, 62; 9BBF, 18; 9DYZ, 3; 9MF, 35; 9APW, 148; 9YAJ, 102; 9AUL, 74; 9BTT, 17; 9AVZ, 75; total, 721. Spark: 9ZC, 16; 9AIF, 5; total, 21.

East Gulf Division—C.W.: 4BQ, 25; 4NM, 5; 4IV, 10; 4FV, 5; 4KU, 14; 4HW, 264; 4KF, 80; 4CY, 8; 4JY, 38; 4AU, 66; 4EH, 15; 4CG, 4; 4EB, 32; 4BY, 4; 4EL, 32; 4FQ, 38; 4JK, 35; 4EG, 38; 4BF, 100; 5ES, 13; total, 826. Spark: 4BI, 71; 4HS, 40; 4HX, 10; 4MY, 3; 5XA, 6; total, 130.

Ontario Division—C.W.: 3CO, 10; 9AL, 38; 3HE, 10; 3JI, 10; 3JK, 10; 3KP, 30; 3ACJ, 5; total, 113. Spark: 3FO, 8.

Rocky Mountain Division—C.W.: 9ZAF, 30; 9DTE, 10; 9AMB, 61; 9DTM, 38; 7AFW, 7; 7LU, 206; 7ZO, 19; 6BOE, 20; total, 391. Spark: 7DH, 9; 6ATH, 17; 6BKE, 9; 6ATQ, 19; 6ARU, 10; total, 64.

Vancouver Division—C.W.: 5BQ, 12; 5CT, 6; total, 18. Spark: 5CN, 15; 5DO, 5; 5EC, 8; 5DK, 6; 5CD, 5; 9BD, 46; total, 85.

West Gulf Division—C.W.: 5DW, 33; 5SF, 34; 5QI, 132; 5DI, 39; 5IR, 26; 5QS, 10; 5VA, 25; 5XY, 7; 5VO, 5; 5YK, 2; 5AE, 27; 5BA, 12; 5ZX, 1; 5IM, 15; 5XV, 7; 5ACF, 5; 5PO, 3; 5ZA, 19; 5ZM, 2; 5ZAV, 15; 5ZG, 7; 5RJ, 15; total, 441. Spark: 5ACQ, 25; 5TU, 36; 5QT, 6; 5CK, 6; 5UG, 5; 5IR, 30; 5WU, 2; 5QS, 15; 5ZAW, 10; 5ZC, 3; 5ZAE, 8; 5ACU, 5; 5YK, 35; total, 186.

Winnipeg Division—C.W.: 4BV, 45; 4GB, 5; total, 50. Spark: 4CE, 2.

Midwest Division—C.W.: 9DRA, 14; 9JA, 53; 9DBL, 4; 9AMU, 20; 9ARZ, 30; 9PSZ, 30; 9DZQ, 55; 9AYS, 100; 9AON, 250; 9BED, 50; 9DXN, 3; 9NU, 5; 9FM, 8; 9DJR, 15; 9AQR, 3; 9BSG, 167; 9BGH, 70; 9BZI, 53; 9AMI, 44; 9DKY, 40; 9FK, 26; total, 1040. Spark: 9YM, 16; 9AAU, 3; 9DZY, 50; 9RR, 50; 9DJB, 30; 9BMN, 40; 9DRA, 17; 9JA, 29; 9YA, 14; 9FK, 6; total, 255.

Rosnoke Division—C.W.: 8AFD, 150; 8BPU, 23; 8AUE, 7; 8SP, 56; 8CAY, 12; 8AMD, 148; 8BDB, 26; 8BKE, 53; 4LJ, 13; 4NV, 23; 4EN, 17; 4DC, 39; 4GX, 32; 4GH, 104; 4DS, 34; 4LP, 15; 4KC, 4;

4EA, 340; 4FT, 28; 4BX, 320; 4NT, 27; 4ID, 18; 4CQ, 6; 3BLF, 99; 3BZ, 36; 3AEV, 31; 3BVL, 35; 3CA, 34; 3BIJ, 18; 3APR, 12; 3AJG, 12; 3MO, 2; 3AUU, 23; 3BMN, 8; 3TJ, 70; 3MK, 212; 3ZZ, 85; 3IW, 7; total, 2179. Spark: 8IC, 3; 8BDA, 224; 4MF, 10; 3ACK, 21; total, 258.

Northwestern Division—C.W.: 7TH, 43; 7OT, 32; 7IY, 80; 7MF, 22; 7NN, 17; 7OE, 14; 7AGF, 13; 7QD, 12; 7HM, 7; 7UU, 5; total, 195. Spark: 7BK, 96; 7AW, 77; 7GE, 67; 7NW, 41; 7BG, 33; 7KJ, 27; 7OT, 24; 7IW, 14; 7IB, 14; 7NC, 6; 7ON, 6; 7TW, 6; 7FD, 3; 7PQ, 3; 7FH, 2; total 419.

New England Division—C.W.: 1ACU, 197; 1ASF, 148; 1AZW, 72; 1BAS, 27; 1BDU, 27; 1BKQ, 472; 1BNP, 23; 1BVH, 44; 1BRQ, 36; 1CAJ, 24; 1CBJ, 4; 1CBP, 58; 1CCZ, 33; 1CHJ, 126; 1CK, 30; 1CMK, 107; 1COT, 42; 1CPN, 312; 1GV, 63; 1PT, 23; 1SC, 20; 1SD, 101; total, 1989. Spark: 1AHT, 21; 1BJS, 23; 1BRQ, 3; 1BVB, 95; 1DY, 10; 1LZ, 63; 1SC, 20; total, 235.

Delta Division—C.W.: 5JB, 10; 5UK, 15; 5EK, 25; 5NV, 18; 5DO, 12; 5FV, 12; total, 92. Spark: 5ZL, 81; 5XAC, 29; 5JF, 11; 5ZAU, 8; 5BW, 5; 5MO, 20. total, 154..

Pacific Division—C.W.: 6BJX, 33; 6AGH, 1; 6BPZ, 18; 6BQC, 19; 6CU, 28; 6ALU, 18; 6EB, 11; 6FT, 22; 6RR, 15; 6JD, 6; 6KA, 22; 6EN, 14; total, 207. Spark: 6AWE, 10; 6BPZ, 17; 6ADG, 2; 6KE, 13; 6OD, 31; 6ALD, 5; 6OL, 28; total, 106.

ALASKAN DIVISION

Roy A. Anderson, Mgr.

Mr. Leon C. Grove, former 7EP, of Kenai was in Ketchikan attending the Teacher's Institute and while there paid a visit to the D.M. Mr. Grove said that he hoped to install a fifty watt set (C.W.) this year at Haines where he is to teach. In view of the fact that Haines is sort of a hole, it is doubtful that even such a powerful set will carry the signals from there to the States, but it is hoped that some sort of a relay can be effected between Haines and the States.

Sturley in Chignik reports that between schedules and daylight he has little chance to listen for any DX. 7UF at that place now has a Reinartz and it is hoped that the long winter nights will bring some in the line of good DX.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

The message traffic report for this division shows that there is a rapid returning to the game. Stations in and around New York are doing much better work and the change of weather brings more

and more stations on the air every night. New Jersey stations continue to move traffic with the same reliability and traffic routes are open in all directions. A great deal of traffic moves into the southern divisions by way of New Jersey. Next month will see some regular detailed reports from New York and New Jersey in addition to a much larger traffic report.

PENNSYLVANIA: Unless Rau gets some action from some of his men he is going to withdraw some certificates. ('atta boy Jimmy, 100% or nil—F. H. S.) 3QN is back on the job with three ops. 3BNU is using his squeak boxes on tubes, FB. 3ZO has schedules with 3ADX, 3ANJ, 3ALN, 8XJ and 8ZZ. Philadelphia is well equipped for all traffic with 3ANJ, 3BJY, 3AGN, 3SM, 3FS, 3QV and 3VW. The following appointment has been made in Western Penn: G. L. Crossley, chief op at 8XE, superintendent of district #7. W. K. Thomas, 17 Emerson Ave., Crafton, Pa., has some vacancies and wants to hear from men desiring to participate in League work.

DIST. OF COLUMBIA: The Washington Radio Club called a special meeting to elect H. A. Wadsworth, 3JJ, assistant division manager for D. C. Washington has some excellent traffic movers in 3ALN, 3ZW, 3JJ, 3LR, 3IL, 3KM and 3OK. In a short time Herb Hoover, jr., will break out with a C.W. set of about 500 watts, with the call 3ZH. (FB OM, we welcome you on the air and trust you will give the gang a lift with tlc—F. H. S.)

MARYLAND: Outside of the work being done by 3HG, 3AJD and 3WF there is not much to report. Maryland stations have not returned to the fold as yet. ('smatter gang, is the broad-caster stepping on your toes? Come on, get back on the air, we need you!—F. H. S.)

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

MICHIGAN: The 375 meter route through to Grand Rapids is functioning without a hitch thru 8ZZ, 8ZF and 8ZAG in daylight.

Inasmuch as nearly all operators are back on the work now we expect to swell our traffic reports very much. This month shows a decided increase. Detroit has 24 stations doing DX work, at least they try, but QRM is awful for getting traffic through. QRN has been almost incessant throughout the month and many of us have almost come to the conclusion that the Gulf District was trying to put something over on us. No messages were handled so far, but we are going to get started 100%.

We are very desirous of hearing from stations in the state who can maintain

a daylight schedule. Please let us hear from you at once. We believe we are much better equipped to handle the work efficiently than ever before and look for improved service through this District.

Mr. Sirrine, D.S. of district #3 has resigned for lack of time and in his place Chas. E. Holmes 8ZAG, 310 W. Bron St., Grand Rapids, Mich, has been appointed. 9BOH is on with 1 k. w. spark. 9AXN at Laurium has junked the spark coil and purchased a $\frac{1}{2}$ k. w. spark. 9AEN has the 100 watt C.W. set nearly completed. 9AJU is temporarily out of commission owing to that famous spark illness of punctured condenser, but will be on again in a few nights. No report from 9DWV this month, but he has his 10 watt C.W. set finished. 9CGE is undergoing improvements remodeling the $\frac{1}{2}$ k. w. spark and installing a new receiver. 9CE is on with the 10 watt C.W. set. 9BTC will be on before long with a C.W. set. 9DRR is on with both $\frac{1}{2}$ k. w. spark and C.W. 9DWR is on again with a new oil immersed condenser and is trying to blast the ether on full power. 9OL is on nightly except Sundays with five operators.

We are very glad to note the increased enthusiasm in district #4 and certainly hope that things continue in this district as well as they have started.

INDIANA: 9YB has been in operation a few nights, but will be more active hereafter as arrangements have been made for power from 10 P.M. until 1 A.M. on every night of the week except Friday. This will enable 9YB to get into the DX game in better shape than before. 8XJ, Ohio State University, is a convenient connection to the east. 9BLC will be off from the air for sometime, as Mr. L. M. Clearwaters, the owner of the station, is in a hospital in Indianapolis due to a recurrence of an old disability contracted during the war.

We have not had the opportunity to look over our fall group of operators, but there are quite a number of well known amateurs here. Among the new ones are: 9FS, 9DEK, 9VL, 9AGR and others. An operators' course is being planned which will be held periodically for the purpose of code practice, study of radio laws, and handling of message traffic in accordance with the A.R.R.L. practice, etc. We think there will be a very good bunch of operators developed before the end of the year, thus improving one of our weak points in the past.

KENTUCKY: Because of the pressure of other business Mr. Kolb, assistant division manager for Kentucky, has resigned and Mr. B. L. Brown, 9UH, of Newport, has been appointed acting assistant division manager for Kentucky.

The following appointments have been

made: Mr. Pflumm, 9OX, district superintendent of Louisville and vicinity; Mr. Anderson, 9EI, district superintendent of Lexington and vicinity; Mr. Defenbroch, 9APS, city manager of Covington supercedes Mr. Kleaman, 9VZ, who has temporarily dropped out of the game. 9GX is now city manager of Louisville and 9IO is city manager of Newport.

There is now a daylight route from Newport to Louisville via 9APS, 9UH, 9EI and 9OX, also traffic can now be successfully handled between 9OX and 9UH at night on C.W. It was an impossibility heretofore.

OHIO: In Ohio things are progressing as usual under the able leadership of Mr. Candler, and the message totals continue to pile up as a glance at them will show. R. D. McCommon, of East Palestine, Ohio, has resigned his position as district superintendent of district #6. His successor has not yet been appointed. A great number of new appointments have been made as official relay stations and in general, Ohio is living up to its past record. 8ZY has his station in operation and is handling traffic again. A number of new appointments will be made in the Toledo district as Mr. Duerk has not received the co-operation that he should have, and accordingly, this district will receive a thorough shake-up. Applicants for city manager and official relay station appointments are requested to get in touch with Mr. Duerk at Defiance, Ohio at once. In the Toledo district 8BEP, 8BRY, 8ZY, 8TK and 8ASZ are handling the bulk of the traffic.

WISCONSIN: No report received for September from the assistant division manager for Wisconsin, but two reports received direct from the district superintendent of the second district of Wisconsin and from the West Allis Radio Club. 9AFK has a noon day schedule with 9WX, 9AJH, and some others around Chicago and vicinity. Also on Monday, 9DHK, C.W.; Tuesday 9ALR, C.W.; Wednesday, 9AFK, C.W.; Thursday, 9BAC; Friday, 9DEL, spark and C.W., and Saturday, 9DXT, spark and C.W. These men will be on all evening of the days stated.

The Chicago Plan governs here with a few changes made necessary by local conditions. Mr. Maas of district #2 reports that things are getting lined up in his district with his station 9AZA handling considerable traffic.

DAKOTA DIVISION

N. H. Jensen, Mgr.

The weather man or whoever it is that dishes out static so generously during the summer months has certainly had a change of heart the past month. The atmosphere

has cleared up to a great extent and traffic has started to move in big chunks, especially through southern Minnesota. Some complaints are being received about broadcasting stations monopolizing the air until late hours, and it occurs to the D.M. that in cities where broadcasting is being done after 10 P.M., it would be well to have the radio club or other amateur organization send a representative to confer with the management of such broadcast station with a view of regulating the hours for the different classes of radio work. This would tend to create a better feeling and better understanding between the amateurs and those in charge of the broadcast stations.

MINNESOTA: City Manager E. S. Hayes, has had a conference with the operator in charge of WJAP about the QRM caused by the station, and Mr. Hayes was politely informed that he (the Opr.) would broadcast any time he pleased and as long as he pleased. This is far from the A.R.R.L. spirit. 9BAV and 9BAF are doing good work. 9ABB expects to have his 10 watt C.W. going soon. 9FH is getting in shape for the big rush. 9GW reports that he will have his station overhauled and ready. 9ADF will be on the job strong again this fall if he can ever get those 50 watters he has ordered. 9CO has sold his rock crusher and is thinking kindly of C.W. now. 9PN is on the air with C.W. and expects to have his spark going soon. 9ZC reports that he has worked 9CDV in daylite and looks for a good relay station in 9CDV the coming season. 9ZC clears regularly with 9YAF at 10:45 A.M.

The division convention seems to have stirred up a little more activity in this district and traffic is moving much better. In the Twin Cities the broadcast stations keep the air jammed until 11 P.M., so 9DR, 9APW, 9BJV, and others go to bed early and get up about 2 A.M. and in this way make use of the best hours of the night. 9YAJ is keeping an all night watch on Tuesday, Thursdays, and Saturdays. 9BBF is on the air quite regularly with 100 watts and 9AWM is on part of the time with his big fellow (250 watter). The Fairmont gang, who have been laying somewhat low during the summer, are again active. 9DGE and 9BKV are going with 50 watts each, and 9BJP and 9ACD are back on the air with spark and are getting out fairly well. 9DGM is on with 100 watts C.W. 9XI will be heard when school starts. 9YX is heard occasionally with a sink spark, 200 watt C.W. and fone. 9MF has been heard 1090 miles with 5 watts. 9CMM will soon be going with 10 watts. 9APW is doing exceptionally good relay work, as also are

9BJV and 9DR. 9BTT has a 10 watt C.W. and is getting out in fine shape.

SOUTH DAKOTA: 9AVZ again heads the list for traffic handled in this district. Burning out a 50 watter caused this station to go out of commission for a short time on September 10th. He has a distance record of 150 miles to 2BRC. 9AIF and 9AIG are again on the air occasionally. 9DKQ is reaching out in good shape and should make a good relay station this year. 9YAK, 9BRI and 9BOF are being overhauled and will be going soon. 9AYW is out of commission for a short time with a punctured condenser. District superintendent, Charles T. Norton is leaving this month for Ames, Iowa where he will attend school.

DELTA DIVISION J. M. Clayton, Mgr.

Traffic is again moving along in fair quantities, due to steadily improving weather conditions. Static has shown signs of abatement and both sparks and C.W.'s are getting through in fine style.

ARKANSAS: After a summer of the most terrific QRN ever known, Arkansas is taking a new lease on life, wirelessly speaking. All of the stations have not yet resumed operations but signs of life can be noticed on close observation. 5ZL in spite of the often expressed love for his spark, is flirting with C.W. and next month should see him with a full fledged 20-watt set in operation. 5JF is on occasionally, and has handled some traffic. 5JB has moved his station to an observatory 900 feet above Hot Springs, and has his aerial on a 185 foot tower. He is putting 3 amps of C.W. energy in his antenna and is now on regular schedule from 10 P.M. to 2 A.M. 5XAC has been appointed D.S. of district A. All stations in this district should send reports on form No. 1 to him. 5WF is still on the retired list. 5ZAZ, D.S. of district B, reports ND in his section, and also reports that he may soon boom forth with 2 K.W. spark in addition to his C.W. set.

LOUISIANA: Mr. J. A. Pullen, famous 5ZAB of Houma, Louisiana, has been appointed Assistant Division Manager for the state of Louisiana. Nothing startling or new has taken place during the past month. 5UK and 5LA at New Orleans, are punching the ether full of holes and moving a considerable amount of traffic.

MISSISSIPPI: 5YE will be with us very shortly. 5ZAU, at Bay St. Louis is now ready for operation but tied down by a peculiar kind of static that inhabits that part of the country.

TENNESSEE: District number one is beginning to show life and no doubt will continue to advance towards the front place while district number two is still

waiting for broadcasting to cease. (?) At Chattanooga, 5HL was the first station that succeeded in reaching beyond the city walls. He is getting out fairly well with his 10 watt C.W. transmitter and is ready to handle traffic for his city. The city manager is still unable to reach out with his 20 watt set and will soon try 100 watts. Nashville, 5ER, city manager, having returned from an all summer vacation, is now ready to handle traffic and promises to keep on watch all winter. 5FV has been the only station in operation and is handling some traffic. (Keep 'er up FV!) Knoxville seems to be a center of inactivity.

EAST GULF DIVISION B. W. Benning, Mgr.

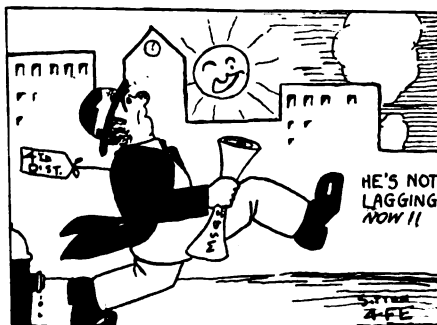
GEORGIA: 4BQ is back on the air with his 500 watt C.W. set and is punching a terrible hole in the ether. He is working daylight schedules with practically every station in North Georgia and is trying to connect with 4BY. 4NM is working daylight schedules with 4IV, 4FV and 4EB. He is reaching all over the country on his 10 watt C.W. set and will make a good relay link this winter. 4IV is still doing fine work and reports that his city is connected with Rome, Athens, Winder, Atlanta, and Palmetto by daylight routes. 4AG reports that his antenna is down and no transmitting is being done. Rumor has it that the Old Man will be located in Atlanta soon and if this is so we will have another fine station in the Gate City. 4FV is reaching out with his small C.W. set in fine style and will take care of all traffic through Athens in spite of the loss of 4AG.

This district is certainly leading the East Gulf in the daylight routes. Traffic is going from Atlanta to Savannah via the short jump daylight route.

Although 4BK has sent in no report for the month we have the reports direct. Mr. C. L. Donaldson, 4RI, has recently been appointed city manager of Atlanta. He reports that the local broadcasting schedules make it practically impossible to do any work before midnight, but that traffic is going through in spite of the mush. The local C.W. men are able to work after 10:00 P.M. and are pushing stuff through but the spark stations are very seldom heard handling traffic until after midnight. 4HS is now a member of the early morning club and is never heard on the air until 3:30 A.M. or 4 A.M. 4HW our star station is fast becoming a member of the boiled owl's club as he is on until daylight practically every night and is growing corns on his ears from a continual wearing of the cans. 4EH is going strong with his 20 watt C.W. set and has been reported QSA in the 6th district on 1.6 amps. The

following stations are all doing good work: 4CG, 4KF, 4HX, 4MY, 4CY, 4AU and 4KU. 4AY has dismantled his station for the winter due to leaving the city. 4EB is reaching out all over the country with his 20 watt C.W. set and handling traffic like a veteran. 4DH is getting his station back in shape again. A C.W. set will be included in his new installation. 4GN and 4FD are still plugging away with their rock crushers, handling traffic and cussing the D.M. for not reporting their stuff. (Right here said D.M. wants to say that after this month some changes will be made in district #2) 4EL is doing the best work in this city at present. 4BY's new 500 watt C.W. set is on the air but is not working just right up to the present. He says that both he and 4GL will be going strong by the time this report is out.

SOUTH CAROLINA: This state is coming out of the hole rapidly and is getting lined up for a rushing relay season.



Districts are being laid out and superintendents being appointed. Good stations are getting into the air and some little traffic is passing through every night. 4FQ is still handling traffic on his 5 watt bottle. 4LA is reaching out and working quite a few DX stations of the 8th and 9th districts. New stations are springing up fast and at present the following are in operation and doing good work: 4FE, 4KE, 4KI, 4IB and 4JK. 4JK is doing the best work with his small 20 watt set and has daylight schedules with 4EG of Woodruff and 4FQ. He is pushing the traffic into North Carolina and Georgia; something that has been impossible before.

Mr. G. W. Etheredge, Jr., has been appointed assistant division manager to take his brother's place as Mr. W. C. Etheredge has resigned. Young Etheredge is going after his men and is rapidly getting the state into shape for a real live relay season. He is operating 4EG and is handling most of the traffic in daylight with 4FQ and 4JK.

FLORIDA: A.D.M. Harrod has gone to college and C. F. Clark, 4EZ, has been ap-

pointed to serve in his place during his absence. We regret very much that we must lose 4II this winter, and we will welcome his return next spring.

Jacksonville, Fla. is suffering a relapse. All stations are out of operation for various reasons, and immediate prospects are discouraging. 4HZ made a good start with his C.W. set, but blew his tubes and is out until they can be replaced.

4BF has his C.W. set going again and is working PACIFIC COAST STATIONS, although he has been in operation but a few days. 4JY has been having his difficulties. Although he blew two fifty watters, he is not discouraged and is working real DX and handling messages. 4IZ C.W., failed to report but he is heard consistently and is handling messages.

Superintendent Woods, advises no activity and nothing to report. Superintendent Brookwalter reports that activities in his section are lagging, but we believe he is holding out on us. 4DL and 4BC are heard getting through in fine style, but we have no report from them. 4DZ now has a C.W. set in operation, in addition to his reliable spark.

ALABAMA: 5ZAS has not handled any traffic this month as they are rebuilding their station for the winter work. 5DG is ready with a 15 watt C.W. set. On a test with Mobile he was reported QSA there, so should have no difficulty in working the fellows there. 5ZI is ready with 100 watts of C.W. and promises to make things hum. 5CP is starting out with 5 watts. He has the makings of a real amateur and we are looking for good work from him. Due to bad location, 5AX, with his $\frac{1}{2}$ K.W. spark and 5BQ with 20 watts of C.W. have not been able to reach out anywhere. 5ES is the leading station in the state for the month. Both, 5AEK and 5VJ are just opening up with small C.W. stations and look promising from a DX standpoint.

5XA is just opening up a new super station and threatens to lead the whole south in handling traffic this winter. They have six complete transmitting sets both spark and C.W. ranging from 200 watts to 5 K.W. and their receiving system includes 6 different sets. This station will be operated by 9 first class operators and a continuous watch will be held. 5XAE is on the air with 100 watts, operating at present on 275 meters, but no traffic handled yet. This station reports hearing 5XA of Auburn and 5DG of Birmingham consistently. We are glad to hear this and hope that they will have no trouble in working both ways as it has never been done before.

The division manager is glad to report that this month has been the turning point of the summer season. For the first time in three months we have reports from every

state in the division and it is sincerely hoped that the good work will be kept up.

MIDWEST DIVISION

G. S. Turner, Mgr.

All the fellows in the division are to be thanked for getting the reports in on time, and we will forget the past because we have too much to do in thinking of the future. Each state has been divided that the work may be distributed more evenly for the present. At a later date all states in the Midwest Division will be sub-divided into districts by counties, making room for more officers to carry on the League work. Assistant division managers in the Midwest division are as follows: Nebraska, J. G. O'Rourke; Iowa, P. A. Stover; Missouri, C. L. Klenk; Kansas, C. Himoe.

NEBRASKA: Nebraska is divided into a northern district and a southern district by the Platte River.

The following named men have been appointed in Nebraska; District Superintendent South Platte, Paul Palmer, 9NC, 3145 "S" St., Lincoln, Nebr.; route manager, Edwin R. Anderson, 9EW, 308 North 27th Ave., Omaha, Nebr.; Omaha city manager, Porter H. Quimby, 9DXY, Benson Gardens, Omaha, Nebr.; Lincoln city manager, Paul C. Rohwer, 9AYS, 2041 "K" St., Lincoln, Nebr.

Mr. Anderson, the route manager for the district, is busily engaged in re-organizing the old Nebraska short jump relay routes. Many of the old standby stations are in operation and traffic is moving efficiently in practically all directions. 9AYS grabs the first prize for the number of messages handled this month.

Omaha expects to have at least one real station on duty this winter that will be able to handle all traffic that comes its way. 9SC is being combined with 9HT, the station belonging to the assistant division manager. These two fellows have a lot located on the highest point in Omaha and are installing two of the big tubes. They stand a good chance of being the star station in this division this winter.

IOWA: Iowa is divided into an eastern district and a western district by drawing a north and south line through Des Moines.

The following named officers are appointed for the state of Iowa: District superintendent Eastern Iowa, D. I. Bailey, 9CS, 525 Knelworth Ct., Clinton, Iowa.; District superintendent western Iowa, D. R. Watts, 9ARZ, Clear Lake, Iowa; Route Manager, Anthony Paone, 9BSG, 606 S. E. First St., Des Moines, Iowa.

Weather conditions have been favorable and a great increase in traffic was noticed during the past month throughout the state. Stations are again able to work DX

with ease. 9BSG handled the bulk of the traffic. 9BSZ is with us again on C.W. 9BGH, 9BZI and 9AMI are doing some excellent work all on C.W. 9FK seems to be the most reliable station in the Eastern section. We crave action from Davenport. Get out the old Rock Crusher if you can't pick up a C.W. set. Messages pile up for Davenport with no way of getting them there. 9AOU and 9DRA are hitting the ball again after a several weeks lay up for repairs. 9JA has been moved from Mar-engo to Iowa City and will be going as strong as ever there. 9YA will be on this winter with 200 watt C.W. on 200 meters.

MISSOURI: Missouri has been divided into an eastern district and a western district by drawing a north and a south line through Moberly.

Only two appointments have been made for Missouri due to the fact that an insufficient amount of time has been allowed to properly comb the field. The following appointments have been made: Route manager O. McDaniels, 9YM, 816 Rollins St., Columbia, Mo.; City manager, Leslie Essington, 9BED, St. Louis, Mo.

Sedalia is rapidly coming to the front and should have an A.R.R.L. representative on hand there for duty. Cape Girardeau in the southeastern part of the state is coming fast. It is reported that Slater, Sikeson, Chafee, Marshall and Jackson have good stations and require organization.

Among the more active stations in Missouri are: 9AON, 9BED, 9DZY, 9BMN, 9DJB, and 9RR. A number of the other fellows sent in their message reports but did not handle many. The route manager is working over the old routes and you fellows who desire to get lined up on any of these routes please get in touch with the D.M. Kansas City and St. Louis are still holding their own against the broadcasting stations, thanks to a few good hard boiled DX owls.

KANSAS: Kansas has been divided into a northern and a southern district by drawing an east and west line through Emporia.

The new appointments in this state are as follows: District superintendent southern district, Clifford Rogers, 9ABV, 226 E. 6th St., Hutchinson, Kansas; District Superintendent northern district, Earle Beardmore, 9AEY, Glasco, Kansas; Route manager, Ray Youngmeyer, 9PS, 125 N. Volutsia Ave., Wichita, Kansas.

Many of the last year's sparks are gone for good this year. 9PS has dismantled his sink spark and is using C.W. entirely now. 9DSD, 9DUG and 9ABV, all former sparks, are doing most of their work on C.W. now. 9AEY is working on a 50-watt tube and 9DEF is installing a ten-watt set. 9CCS, 9BHN, 9DUN and 9CFI have all

been doing excellent work on low powers. All are C.W. too, which explains it.

Work is being done on the organization of "sure-fire" daylight routes and we are preparing for all special tests now. Our one hope is that all messages on any special tests get as far as Kansas so we can show what we can do. We desire to hear from anyone in the state of Kansas who is interested in our A.R.R.L. Let us all co-operate and make Kansas one of the best states in this Division.

NEW ENGLAND DIVISION

P. F. Robinson, Mgr.

MAINE: This state is not up to its usual standard this month but still manages to keep its head above water and keep the traffic moving. Handy, 1BDI, reports that he will be on the job this winter at the University of Maine with a 100-watt C.W. set and is getting all set for the next Transatlantics. Hilton and McShane have been trying to get their districts going a little better and by cold weather we will see the results of their work in the shape of traffic.

NEW HAMPSHIRE: New Hampshire is dead, or at least no one up there is making any noise to disprove this statement. How cum N. H.?

VERMONT: Vermont is right in New Hampshire's class except that every once in a while 1ARY gets that great big stone crusher going and then— But what's the matter with the reports?

MASSACHUSETTS: This state takes the prize this month in the New England division for the amount of traffic handled and 1BKQ seems to top the list with 20-watts of C.W. and 472 messages moved, 1CPN, 1CMK and 1ASF are also pushing the traffic along with their C.W. 1CNI is making an awful disturbance with his spark, being heard in about every district in the country but evidently doesn't handle any traffic; anyway, no report turned in. Any msgs, Reynolds?

RHODE ISLAND: Since the appointment of Fancher, 1BVD, Rhode Island has surely taken a new lease on life, new sparks are opening up and also new C.Ws. By next month we should hear who is who in the DX gang. 1AZW is now in Providence operating the broadcasting at WEAN and pushing the key at 1GV along with Tilley; they are planning on a 100-watt set soon. 1CJN is operating a ½ K.W. spark and should turn in a good account of himself before long. Fancher says he is experimenting with a 5-watt C.W. set for "local work" which marks the passing of another stone-crusher.

CONNECTICUT: Experimenting with antennae must have got 1QP out of the habit of turning in reports but from the R. I. A.D.M. comes the information that

1ACU, one of the standbys of Southern New England, has closed up at Groton, Long Point and gone to Phillips Exeter Academy, Exeter, N. H., for the winter. Maybe we can get him to put N. H. back on the map. Our ears tell us the 1QP is still on the air along with a surprisingly large and continually increasing bunch of C.W. down in Connecticut. Someone musta stucka pin into the gang at 1AW, they're on quite a lot lately. When arya gonna put in C.W. so we can hear you up around Boston with some satisfaction?

Robinson, 1CK, has resigned as Division Manager owing to lack of time to put into the work and our old friend VN, Irving Vermilya, ex-1HAA now 1ZE has taken over the job. Lets all us followers get behind Amateur Number One and make New England the best division in the A.R.R.L.

NORTHWESTERN DIVISION

H. F. Mason, Mgr.

MONTANA: The following change in personnel has been made since last month. 7AGF at Troy, Montana has been appointed Dist. Supt. for Dist. No. 1, succeeding 7VZ, who has left the state. Many stations are opening up, and traffic is passed through this state in fine shape now. 7AFG at Troy is keeping up 7VZ's good work in the northwestern part of the state, and handling things well. The following stations are on the air regularly, and QSR relay traffic, 7ZU, 7ZG, 7AGF, 7QD, and 7HM.

IDAHO: Activities are on the increase with the coming of winter. 7JF and 7WG are keeping the air clear in the northern part of the state, but report no new stations on the air. 7OT, 7YA, 7AEM, and 7LO are making Boise quite a relay center of the northwest. 7YA is using his old spark set temporarily but will have that 200-watts of C.W. on the air soon. 7LN and 7EG are handling traffic in the southern part of the state. The static season being over, the fellows are coming back on the air again, and getting down to business. The ninth district stations are pounding in with their old time intensity, only we miss the sparks. Traffic through Idaho will be handled promptly if routed through one of the above stations.

OREGON: Mr. Royal Mumford, 7ZJ, A.D.M. for Oregon, has resigned owing to the pressure of other business. We are all sorry to lose him as he knows the amateur game well. However, we'll call the gang together soon, and elect a man to fill his place. In the meantime, we can only give a summary of the activities. In Portland, stations doing DX are 7ZB, 7JW, 7ABS, and 7VF. In Eugene, 7MF, 7IW, and 7TW are still doing good work. Summer static has stopped, and receiving conditions are

much improved. There seems to be quite a bit of activity throughout the state, but in some parts, there's something lacking. Guess its the spirit. Let everyone operating a transmitter in Oregon think matters over seriously, and when we get the new Asst. Div. Manager appointed, give him your whole-hearted co-operation towards better reports in QST and a livelier interest in things in general.

WASHINGTON: Traffic over this state is taking a turn for the better. C.W. is playing an important part. In the Grays Harbor District, D.S. Hemrich reports the following stations on the air and taking traffic, 7NN, 7SC, and 7SF. 7NW has gone to Pullman to college, and expects to pound brass at 7FI this winter. In the Tacoma District, 7AGI, 7AW, 7BG on spark, and 7WM and 7QE on C.W. are doing a little DX. If some stations in this district would give as much attention to LD work, as they do to local chewing, we would walk off with the honors every time.

Conditions in the Seattle District are very much improved this month. QRN has abated somewhat, and a new set of traffic regulations are in force. 7IY has been showing the boys how to get out on a five watt tube, and a number are following his good example. Among them are 7FD, 7ADL, 7TN, 7BS, and 7OO. 7IM started to junk his spark, but changed his mind. 7BK and 7IY are handling the bulk of the traffic. 7OE in Bremerton is reaching out with his C.W. He states that the QRM from the sparks annoys the ops at NPC, so the Bremerton bunch had to resort to C.W. FB. At present there are three stations here. 7RK, 7OE, and 7WS all on C.W. with more going in soon. Considerable traffic is being handled in this district. Mr. Maybee, 7GE, D.S. of District No. 11 has been appointed Acting Dist. Supt. for Dist. No. 10, and states that if there any stations in this district (Kittitas, Yakima, Klickitat and Benton counties) he will make a trip to see them, and help them out in getting amps into their antennae. 7GE has no trouble in working east or south. 7TH at Walla Walla is also doing good work, clearing 7LU consistently.

In general the routes handling most of the relay traffic are as follows: The route east, which starts at the coast from either 7IY or 7BK or other Sound stations, or from 7SC or 7NW in the Grays Harbor Country, or from 7VF, 7JW, 7DP or 7ZB or others in the Portland District. These stations pass traffic to 7GE at Pasco, or 7TH in Walla Walla. 7AGF alternates for some of the traffic from the northern points. These stations usually pass the messages on to either 7ZU, 7ZG or 7LU, who work the ninth district regularly. 7OT at Boise is also handling a considerable portion of the traffic over this route. It is hard to define a route along the coast into California.

Traffic for those parts usually gets to one of a few traffic clearing stations in Vancouver BC, Seattle, Portland, or Eugene, Oregon, and goes direct to a number of sixth district stations, all of whom are very consistent.

Receiving conditions have improved wonderfully thruout the division, and a large number of stations have logged calls from every district. Everyone seems to be letting traffic slide since the advent of this super-DX craze which the C.W. has brought about. However, we predict that before long, the C.W. DX records will be commonplace, and we'll all settle down and push traffic through again.

ONTARIO DIVISION A. H. K. Russell, Mgr.

Ontario is going to be right along with the rest of the gang in DX relaying this winter if September is any indication of what will come off later. New C.W. stations are heard on the air every night. The Radio Convention held in the early part of the month in Toronto brought out the boys from all over the country and one and all swore they would be on the air this winter to put the Ontario Division on the map.

With the awakened interest in view, and to make the Ontario Division more easily handled, the division manager has cancelled the previous layout of stations by districts. There were formerly six Ontario districts, but these have been cut in half and called western, central and eastern Ontario. All of Ontario lying west of the 81st degree of longitude is in the western Ontario district, and all east of the 78th degree, in the eastern district. All Ontario between these two parallels is in the central district. In accordance with the above redistribution of territory, all appointments in the Ontario Division have been cancelled. The western district hereafter will be looked after as district superintendent by H. R. Byerlay, 9BS, Ingersoll, Ontario. The central district will be handled by the division manager. The eastern district will be handled by Orton Donnelly, 3HE, in Kingston. All men looking for appointments as city managers etc., are requested to get in touch at once, with their respective district superintendent.

Western Ontario, when it gets going, is going to be a regular hive of C.W. activity. 3TA, 3ABX, 3HD, 3BS, and 3BV all will be on with C.W. immediately.

In central Ontario the change to C.W. has been practically complete. 3KP, 3ACJ, 3SJ on the Niagara Peninsula are all members of the Niagara District Radio Association affiliated with the A.R.R.L., and all have well working C.W. transmitters. This organization has appointed G. A. Threader, 3KP, their traffic manager, and his assistance will be greatly appreciated by the D.M.

He lives in St. Catherines. All men in that district should correspond with him. Across the lake in Toronto and vicinity, what efficiency could not do, the inspector has completed. The cutting down and enforcement of the wave of 175 meters announced for spark transmitters has resulted in the practical elimination of this type of transmitter. 3CO has opened up with 2 Mullard 250 watt tubes and is covering great distances. 3CZ, 3CY, 3GK, 9AW and 9AL all have 50 watters going. 3BP is heard occasionally but his commercial activities take up most of his time. 9BJ will operate 100 watts.

In eastern Ontario things have also taken on a rosier aspect. 3NE and 3HE in Kingston are operating both spark and C.W. 3LU is opening up with a couple of Mullard 250 watters. He has Lowry from Toronto down there helping him. 3IL is erecting a 125 foot mast and putting in a 10 watt C.W. Queens University have a special license 9BT but will likely broadcast only. The most promising feature of Kingston is that they are working on schedule with 2AN and 2AV in Montreal.

PACIFIC DIVISION J. V. Wise, Mgr.

(Manager Wise has been away from home for the past month and writes us from Lake Tahoe that he will be unable to get in much dope this month. He hopes to be back with the gang sometime in October. —T.M.)

The weather is getting better every night in this Division and we will soon be back on the old winter schedule again. The eastern stuff is beginning to come better. The route east via Denver is still open. Several of the fellows are putting in sink rectifiers now and will double their kick.

6AAK reports no traffic for his district for this month.

As may be seen from the traffic report of messages handled, C.W. has the lead and it looks as if we would soon have the sparks dragging.

ROANOKE DIVISION W. T. Gravely, Mgr.

Its a sad story mates but we didn't reach that 2500 goal. However, a grand total of 2437 isn't so bad. Make it 3000 next month. Traffic this month is a 500% increase over that of a few months ago. There are a lot of outstanding features in this report and it deserves careful perusal, especially that Porto Rico dope.

Some of the gang have been pining to get in the little box in QST. In order that their wish may be gratified to some extent, we hereby inaugurate our own box which will be a regular feature in our report hereafter. High Traffic station both spark and C.W. will be included.

C.W.
Albert Parker, 4EA
340
New Bern, N. C.

Spark
Stealey & Morris, 8BDA
224
Parkersburg, W. Va.

WEST VIRGINIA: A.D.M. Heck reports great awakening of activity and interest in his state. Although lagging a little in recent reports, it has come forward with a rush this month and eclipsed Virginia and is running North Carolina a close second. 8CHO for several reasons has not been able to handle any traffic this month but he keeps a close watch on the activities of his stations.

First District: D.S. Jones, 8SP, turns in a fine report for his district. 8AFD is heavy man in this district. He is on practically every night and worked 194 stations last month and only using 15 watts. FB. 8BPU and 8AUE are both reaching out and helping make this district a reliable traffic point. 8SP has been working only in jerks but managed to get off 56, including message to Hawaii from 1AW. Watch out for 8AQV with 100 watts and 8AUE with 10 watts, coming up.

Second District: No report from this district. Only one station in it, that of the D.S. Liller of Keyser. We understand he has been on the move which accounts for his inactivity.

Third, Fourth and Fifth Districts: No special report of activities in these districts. Each of the D.S.'s got off some traffic as report shows. Stalnaker at 8CAY 12, Murrill 8AMD fine work with 148. In the Sixth 8BDB and 8BKE to old reliable contributed to the quota. (We wish 8BDB wasn't so hard to send, we might work him more often.) 8BKE is on the air often and handles traffic in snappy style. 8CQH at Huntington is opening up with 50 watter.

A word in passing; your D.M. has heard several comments on the snappy way traffic moves through your division. Keep it up.

Sixth District: Here is where the sparks shine. Our "super" spark 8BDA throws a scare in the C.W. camp with 224, leading the state by a safe margin, using a 1 k.w. coffin, and has worked 5ZA QSA vy. "Watch our Dust!" is their slogan. 8IC, another spark, turns in 3.

VIRGINIA: What's the matter fellows? Everyone sort of slacked off this month. With a little more activity here we would have gotten that 2500. However, with 3IW back with us, believe we can regain our place in the sun. A.D.M. Wohlford requests a little more promptness in turning in reports and that they be itemized more fully.

First District: Only a few stations are working in this district, yet they handled

the bulk of the state's traffic. 3MK is a regular "boiled owl" and uses that 100 watts to shove through 212. He is an old timer who knows how to get the stuff through. F.B., OM. 3ZZ is testing out the 500 watt outfit but hasn't yet struck its stride. 3ACK on spark has handled 21. 3ACZ is moving out of state. 3ATZ and 3BVC have finished their overhauling and are with us once again.

Second District: Say, OM, get that report in earlier and make it more detailed. 3TJ contributed 70 this time which is FB. Petersburg is right with us again, 3AAU 23; and 3BMN 8. 3AAU is working Danville, 150 miles, in daylight regularly.

Third District: 3AJG has a fifty watter on the way but is now using two fives until the big set is completed. He is a newcomer to our traffic report but will be a big help. 3BVL is breaking through in good shape and handling more and more traffic every month. 3MO has not yet gotten up his sticks and is usnig the chimney as a support with the aerial only 8 ft. off roof. Daylight schedules are being maintained regularly with Norfolk stations. 3BIJ is adding another fifty and will be back strong next month.

Fourth District: 3BLF is the only station here. He has just completed an 82' mast and other improvements and will resume his old place in the traffic report.

Fifth District: D.S., Lewis, 3IW, has been off on a Naval cruise and is sorely missed in this month's traffic report, but we are happy to say he will be with us again with both feet foremost next month.

Sixth District: No report. Understand D.S. Bradley is off on a visit.

Seventh District: 3ZX shot a condenser on his spark and is out until he can make repairs. Use C.W. OM, and forget about it. D.S. Key, 3ZAA, has finished his C.W. outfit and will be on soon. He hopes to get stations at Staunton lined up and would like to hear from those interested.

Eighth District: Owens of 3APR at South Boston is now D.S. for this district. He is doing some remarkable work considering the difficulties he has to encounter. He maintains a daylight schedule with 3CA at Roanoke and 3BZ and 3AEV at Danville and is getting some good DX besides. 3BZ and 3AEV at Danville are warming up now and will try and hold down this section of the state. 3BZ is being heard far and wide but other affairs prevent him from working at the set more.

Ninth District: 3RF is back in the game and should be heard soon. 3BHS at Salem is installing C.W. and will be with the gang soon we hope. 3CA is doing the majority of the traffic work in this district.

Tenth District: No report.

NORTH CAROLINA: Just thought we would save the best for the last fellows. The old north state is THERE. We have

got to hand it to you. Over a thousand messages in this state alone! We believe that there is more activity along relay lines in this state than any other in the union. If you don't believe it, read the following:

First District: This district now has a whole string of good ones, 4DC, 4GX, 4LJ, 4NV, 4EN all going strong. Much daylight work is being done and good distances covered. About 25 messages go through this district every Sunday afternoon. In fact, through the entire division a great deal of Sunday daylight work is carried on.

Second District: That Asheville bunch never falls down. Always on the job with a big report. Here's a district where the A.R.R.L. spirit runs high. The old reliables, 4GH, 4DS, 4LP and 4KC are keeping up the good work with 4MW temporarily out of the running, due to transformer troubles. Asheville and vicinity is always a reliable relay point and the good station of that district will keep it so.

Third District: D.S. Robertson reports that nothing can be gotten out of the Charlotte bunch but that he is in hopes that some one will come forward and help out the relay situation there. Charlotte is a horrible example of what broadcasting will do to a town. His own station 4ID has been fairly active and 18 messages have been handled. 4CQ is also heard from with 6.

Fourth District: Oh Boy! listen to this. Over 800 messages handled in this district alone. Surely no division manager could want two better workers than 4EA and 4BX or two more promising ones than 4FT or 4NT. 4FT is working on regular schedule with Porto Rico and handled 8 messages with station 4OI on that island. This is the best piece of individual work done in the division for some time. 4FT by the way, has been reassigned to Donald Parsley, of Wilmington, N. C. and is not located in Atlanta, Ga. 4BX and 4EA have both worked 4OI. All three stations deserve the greatest credit possible for this fine work.

NOTICE: ALL TRAFFIC FOR PORTO RICO SHOULD BE HEADED INTO THE ROANOKE DIVISION WHERE IT WILL BE QSR'ED TO 4FT, 4BX OR 4EA AND PROMPTLY PASSED ON TO 4OI. We claim to be the first division in the country to organize and work a traffic route to Porto Rico and the three stations mentioned above did it. (Wake up East Gulf!) 4NT rolled up 27 this month. FB. OM. D.S. Donahue, 4MF, is still operating spark and handled 10. He is changing over to C.W. Watch the traffic grow. Congrats on your district, OM. (Correction: We said your name was Haiant in our last report. Our mistake, OM, we know now it is Hinnant, but what's a name among hams. Get a call.—T.M.)

Fellows, we don't know where this Roanoke Division will stop. We have got them all taking notice and well they might. Keep up the same spirit and go to it. We just can't express our joy at the fine work being done.

ROCKY MOUNTAIN DIVISION N. R. Hood, Mgr.

COLORADO: The Reynolds Radio Company of Denver started handling A.R.R.L. traffic. In a period of five days they put thirty messages through and the nightly total is growing.

J. F. Carpenter, formerly of Minneapolis, Minn., has become associated with 9ZAF and is now city manager of Denver. Mr. Carpenter needs no introduction to QST readers as he will be remembered as the hero of the storm routes up in the Twin Cities last spring.

It sure sounds good to listen to oceans of C.W. sigs, and lots of I.C.W. stations pounding in with winter intensity. The sparks are there also, but seem to be fewer in number. 9AMB is using one five watt tube for transmitting and he reports that he is getting 2.8 amps antenna current.

The radio club activities have taken a big jump and the entire radio game is rapidly smoothing out. There still exists a need in the phone proposition that will soon become more regulated. Due to that fact not much traffic can be moved through Denver until at least 10:00 P.M.

WYOMING: Wyoming shows a pick up of traffic work along with the rest of the states in the division. Take note of what 7LU has done in traffic handling. 206 messages all on C.W. of 15 watts. 7LU has had two operators on and the station has been on the air consistently. That shows what can be done when we stick by the ship. 7DH has a 10 watt set just about completed and with his spark set, has kept his station on the air. 7AFW using a 5 watt bottle has been heard consistently over a 900 mile radius. He is district superintendent for district #1 of Wyoming. 7ZV has a dinger of a regenerative set made and C.W. sigs pound in. His 20 watts on C.W. with a big "T" aerial will be heard as far as his old spark set, which was one of the best in this country. 7GK is back at Laramie now and we may expect something from the Wyoming U. soon, as radio activities there have started with the fall term of school. 7ZO has a new Reinartz and sigs from the coast to Ohio are QSA. One thing that makes us feel good is that QRN is rapidly on the decline and the nights are practically clear now. More 6th district stations are being heard now and west bound traffic is moving through quite nicely. With a western outlet open we now have outlets in all directions.

UTAH: 6AWH is back on the air with a wicked $\frac{1}{4}$ K.W. spark set that seems to

shatter the C.W. records we hear so much about. 6AWH has a wonder spark set and nightly covers great distances. 6BOE is another wonder C.W. station in this state. With one 50 watter he pushes 5-T.C. amps. up the lead-in. He is vvy QSA all over this division. District #2, has made things move as far as traffic is concerned. It sure looks good to see some of the old A.R.R.L. pep getting back in the state and to see the traffic reports jumping. We have a great many very interesting things to happen this winter which will be the banner year for Utah. 6ATQ, 6ARU, 6ATH and 6BKE did not get a full start but are out for blood now. 6BGH, 6ARU and the Snow Normal School are on with ten watts each and 6ATH and 6ATQ have 5 watters each. 6ATQ has done some wonderful work with his five watts as have the rest of them, being reported QSA in San Diego, Calif. and reliable communication has been carried on with 9BS. Harold Chirstensen, 6ARU, has been appointed city manager for Provo, and Glen Quillman, 6AEZ, has been appointed city manager for Ogden.

VANCOUVER DIVISION

J. T. North, Mgr.

Traffic has been light, but most encouraging reports are coming in from all sections of the division regarding the preparations that are being made for the winter season. Alberta has brought forth two promising stations. 9AC at Calgary, Alta., and 4DQ at Vulcan. Both are working out fine with C.W. sets.

VANCOUVER: The stations handling traffic in this district during the past month are: 5CN, 5DO, 5CD, 3EC, 5DK and 9BD, all on spark. On C.W. 5BQ is the only one on consistently, but 5BR worked south for a short time with 5 watts. 5CN has just got going again on spark but his C.W. is still in the making. 9BD handles traffic with 4BV Loreburn, Sask., regularly and also with 9AC Calgary on schedule and has no trouble working them, as well as dozens of southern stations. There will be a great deal doing in this division in the months following as there are a great many new stations under way.

DUNCAN: Superintendent, 5CT is going fine on low power C.W. and will be doubling his power soon.

PRINCE RUPERT: No report in from Supt. Barnsley, but 5CX on C.W. has just been heard in Vancouver so we should soon be QSO with P.R. and Alaska.

VICTORIA: No appointments have been made here as yet, but 5DX is getting around to 7's on his spark, and is QSO Vancouver. We would like to hear a few more Victoria stations as there are plenty of "nearly good" transmitters over there that should be improved.

In the Province of Alberta, 4DQ, C.W.,

has been reaching out of late and can QSR east and south. 9AC in Calgary is doing good work with a 100 watt set. Alberta amateurs who are willing to take a part in A.R.R.L. work, QSL to the new division manager, 5AK, at Vancouver, and give him a description of your outfit. 9BD will continue to operate all through the winter but the D.M.'s new QRA will be Seattle, where the 7's hold the ether.

5CZ Vancouver, is the new assistant division manager for B.C. and 5CN is city manager for Vancouver. The new crew should keep things moving in relay lines and the "Gang" should give them all the support possible.

WEST GULF DIVISION

F. M. Corlett, Mgr.

There seems to be some misunderstanding about MEMBER STATIONS reporting traffic handled regardless of whether they are OFFICIAL RELAY STATIONS or not. Why certainly, all A.R.R.L. stations are to report the activities of their stations each month. By reporting to your district superintendent he will be in a position to know what you are really doing and if you deserve an OFFICIAL RELAY STATION APPOINTMENT or not. The idea is, all stations that are handling relay traffic will be issued OFFICIAL APPOINTMENTS and eventually it will work out to where only the OFFICIAL RELAY STATIONS will be the ones reporting each month, unless it is some new member station just opening up. Occasionally, district superintendents will include in their reports, reports of non-member stations or stations who have allowed their membership to expire and of course there is nothing for the division manager to do except "blue pencil" these reports.

NEW MEXICO: Traffic is going through OK to the west. No appointments have been made as yet, so applications should be made to assistant division manager, Louis Falconi, Box 421, Roswell, New Mexico, or get in touch with him by radio, 5ZA.

SOUTHERN TEXAS: Summer is gone, and each night seems to be better than the one just passed for relay work. The stations that are operating, no matter where, are all being received in South Texas by the more selective and more up to date instruments which are now in use by practically every old time amateur. And have you too noticed that 10 watt DX comes through with much the same signal strength as the 50 and 250-watt bottles do. East Texas district superintendent Harvey C. Sundstrom, 1716 Lubbock, is still sending out his plea for correspondence with those interested in transmitting in the relay game. Houston has been well represented by 5AE and 5BA during the past month, who are among the few who opened

the season with completed instruments. 5XV was not so good this month. 5IM at Galveston is holding down the island with an efficient C.W. set. Central Texas has the same complaint of lack of stations operating. Dist. superintendent E. A. Sahm, at New Braunfels, is the proper one to correspond with regarding relay station appointments. 5RA deserves special credit for his persistency and good work west this month. District superintendent L. D. Wall, 216 Pereida St., San Antonio, writes that everything is still in his district this month but if building is any indication, next month's report will be startling. 5ADI of the San Benito Radio Club, located way down in the valley, is practically ready to open up, and will be our farthest south station. Far west Texas with El Paso as the center receives no representation this month because of their failure to answer correspondence regarding appointments. Please bear in mind that as individuals you should correspond with your district superintendent, and the district superintendents should correspond with the assistant division manager of your section. This would eliminate the much too heavy correspondence the division manager and the assistant division manager are burdened with.

NORTHERN TEXAS: Mr. J. R. Martin, 517 12th St., Wichita Falls, Texas, has accepted the appointment of district superintendent of district #3 which includes the following counties: Hardeman, Foard, Knox, Haskell, Jones, Shackelford, Throckmorton, Baylor, Wilharger, Wichita, Archer, Young, Stephens, Palopinto, Jack, Clay, Montague, Wise and Parker. All men in these counties please let Mr. Martin hear from you.

District superintendent West, has just returned from a big trip and says that everything is now set for a good season. He is now designing a 100 watt C.W. set. At present Mr. West is operating with Mr. Homver Carr station 5TU. 5TU has no trouble getting messages east and west via 5ZL and 5JB.

5AL has decided that two can live as cheap as one so he has an O.W. for a partner but some how traffic has fallen off this last month. 5DI has a new C.W. station and has done some real DX. 5QI has replaced his old spark with 10 watt C.W. and has worked every district since he started. There will be a 5 watt C.W. at 5PJ which will be operated by the O.W. of the Ft. Worth City Manager, Mr. Garrett. The O.W. at 5PJ will be glad to QSR regularly 10 to 11 P.M. any day. Mrs. Garrett is conducting a class in radio at the Brantley-Draughon College and has turned out several who are doing DX work over the state.

District superintendent Martin reports an increase in activities in his territory.

C.W. signals on amateur waves are increasing and sixth district stations are becoming readable through the atmospherics. Relay routes are under construction in the west part of district 5 and the east part of district 6. 51F now 5ZH has been licensed to work 375 meters along with 100 watts of C.W. 5ZAW is installing 10 watts of C.W. 5VA is installing spark to work along with his 10 watt C.W. (!)

OKLAHOMA: Tulsa now has two dependable A.R.R.L. stations. 5SR has just completed a 20 watt C.W. and I.C.W. using A.C. 5WX has completed a 20 watter using a self-rectifying circuit. Many broadcast listeners of that section have begun to turn and are sending in for licenses, which indicates that some good relay stations may open up soon.

Well! Well! Oklahoma City now has a sure enough O.W.! Can copy about 10 per and learning fast which sounds like business. Of course you are wondering who she is but just to be contrary we are going to keep it a secret for the time being anyway, however, watch you step when working 5ZAT, for the Mrs. may be at the key!

Just seems as if we can't get anybody lined up in the northern part of the state. 5ZZ of Blackwell will not be in operation this winter due to Schonwald being in school. 5ZQ is also away in school and his station will be silent. 5LO has turned toward the commercial game which eliminates another good traffic station. 5PU manages to keep going but latest reports indicate that he will not be on more than three nights per week. 5ZM has been very consistent during the past summer and should be in a position to do some good relay work this season. 5ZAT's 140 foot self-supporting steel mast looks like business to us. This gives Okla City two amateur masts each of which is more than 120 feet in height. 5ZAV is the other "lucky bird." 5XT and 5ZG have arranged a daylight schedule and traffic will be handled. 5ZM will probably be included in this schedule and we predict splendid results. During the summer 5RJ of Sapulpa operated a 10 watter and got out in fine style. 5BM and others are getting lined up for some real work. "BM" reports that his 50 watt set will be going soon after moving to his new location and everything in general rebuilt. Not much activity going on in our southeast and southwest districts. 5DS will be heard before long as a new C.W. is about completed. We have 5TJ, 5HA, 5VM, 5ABB and 5ZG who will be heard during this season. 5ZG will work on daylight schedules almost entirely at which traffic will be handled on fone. 5QH is completely dismantled and may not work any more. 5LB is putting in a fone set. 5MP and 5ADQ are installing 100-watts sets which makes us want to cast a tear for the

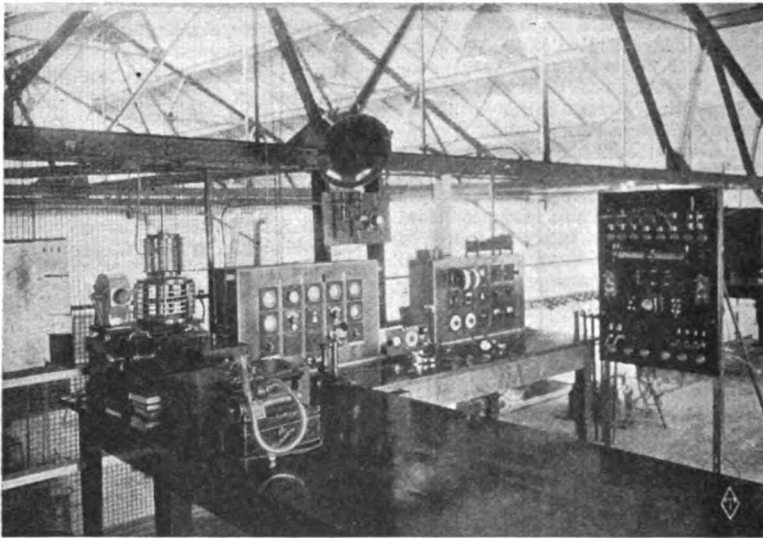
(Continued on page 64)



Amateur Radio Stations



9XAQ, Boulder, Colo.



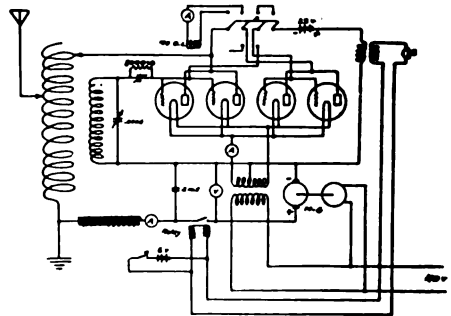
9XAQ is the station of the Electrical Engineering Dept. of the University of Colorado at Boulder, Colorado. Much attention has been given to the most efficient arrangement of apparatus in the station.

The receiving aerial is 300-ft. long, 160-ft. high at one end and 50-ft. high at the other. The transmitting aerial is a 6-wire inverted L directive west, 100-ft. long and 50-ft. high. Ground connection is made to the steel frame of the building in which the operating room is located.

The receiving set consists of a three-coil honeycomb set on unit panels, with one step of audio amplification. Single-layer coils are used for short waves. Several other experimental receiving sets are available, but the honeycomb set is used for regular work and has given complete satisfaction. Brandes, Federal and Baldwin phones are used.

The spark transmitter is used only for emergency work, though it has some good records to its credit. It consists of a Clapp-

Eastham 40,000-volt 1 K.W. transformer, Clapp-Eastham condenser, 10-point Benwood gap, and a "bird cage" O.T. The spark has been heard in 23 states.



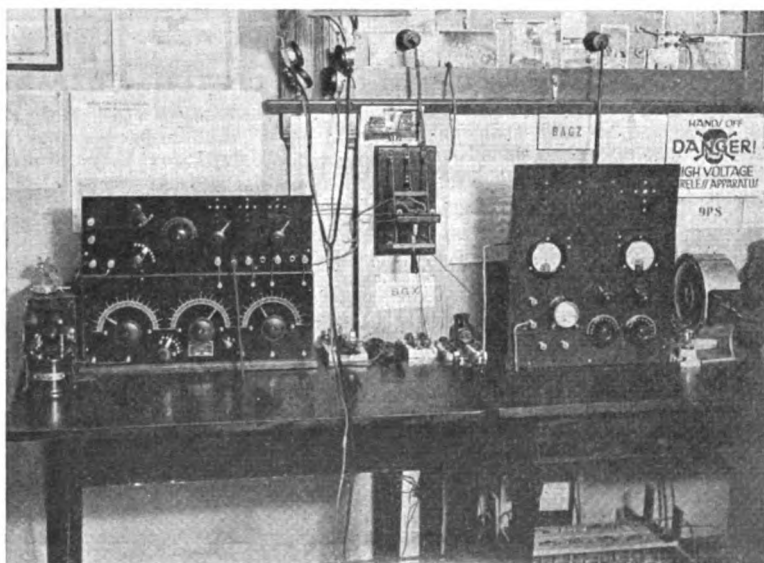
The 20-watt C.W. set, superseding the spark, uses four Western Electric "E" tubes in the 1DH circuit. For phone, two

tubes are used as oscillators and two as modulators in the Heising constant-current system. The antenna-plate inductance consists of 40 turns of No. 12 wire on a 4-inch tube, and the grid coil of 14 turns of No. 20 shunted by a .0005-mfd. variable condenser. The grid condenser is of the same capacity and is shunted by an 8000-ohm grid leak. A Federal anti-capacity switch serves to change from C.W. to phone, as shown in the diagram. Keying is accomplished by breaking the positive high-voltage lead by means of a relay. The Federal microphone is connected in the circuit only when the key is down, thus making it impossible for the operator to leave the station with the battery in circuit with the microphone. The high voltage is furnished by a 600-volt motor-generator set which was wound by the Vocational department. Due to the large number of commutator segments, the oscillograms obtained from the D.C. supply are very good and no hum is noticeable on phone at a distance of 25 miles.

The switchboard on the right handles all the controls with a minimum of time and effort, and with flexibility enough to serve the laboratory for the radio courses taught. This board contains the switches

sounder and substituting the armature of the sounder for the knob of the key. The station equipment also includes a Dictaphone which has been the basis of many interesting experiments. Not only is broadcast music "canned" but the unlicensed Ford coil in the next block is shown what an awful racket he kicks up. (This ought to be a regular feature at radio club meetings.—Ed.)

The results obtained with this low-powered transmitter have been remarkable. The C.W. has been heard in Alaska and the Canal Zone, and in 34 states, as far east as Orono, Maine, and Washington, D.C. Traffic has been handled with Can. 4CB, 7ZJ, 6XAD, 5XU, 4FT, 8VY, and 8AGZ. On 275 meters the antenna current is 5.5 amperes on C.W. and 3.0 on phone. On phone, traffic has been handled with 7YA, Can. 4CB, 5XU, 6ZA, and 9WQ. The best DX on phone was to 9WQ at Carthage, Ill., on which occasion phone was used at both stations. The above results were obtained with normal plate current and plate voltage of 550 volts. A 200-watt set will be in operation for this season. The operators at 9XAQ last year were Robert Owen (RO), Wallace Cassell (WC), and Herbert Anderson (HA), pre-war 1DK.



for the 110 and 220-volt A.C. and 110-volt D.C. lines, the generator field rheostat, the battery charging switch and ampere-hour meter, the C.W. and spark relays, and the starting switches for the C.W. and spark, as well as the lines from the other electrical laboratories in the building. Each relay is ingeniously made by bending the lever of a telegraph key so it hangs over a telegraph

6AWP, Santa Ana, Cal.

6AWP is owned and operated by Everett W. Thatcher, known on the air last year as 8GX. The station is located at 407 W. First St., Santa Ana, California.

The antenna system at 6AWP consists of a four-strand inverted L type aerial

with wires spaced four feet apart. A mast 75 feet in height supports one end and a 50-footer the other end. The lead-in is brought down in the form of an 8-inch cage. A counterpoise duplicating the antenna and directly underneath has been found to be much better than the usual earth ground.

The C.W. transmitter, which is used entirely at present, consists of two five-watt tubes, both as oscillators in a modified Hartley circuit. High voltage is obtained thru an Acme 200-watt transformer and the popular lead and aluminum electrolytic rectifier using a saturated solution of borax. Ten such jars are used (as shown in the photo) and no trouble has been experienced from overheating or crystallization. This system delivers about 500-volts which is filtered by two 1-mfd. condensers connected on each side of an Acme single-coil choke. When the tubes are oscillating at maximum efficiency the plate current is 95 to 100-milliamperes and the antenna current 1.7 amperes on 200 meters.

The receiver is a Z-Nith Regenerator with a two-stage audio frequency amplifier and Western Electric phones.

6AWP has been frequently heard over 2000 miles. Reports have been received from Cleveland, Ohio; Key West, Fla.; Yukatat, Alaska; and Wailuku, T.H. Consistent work is carried on with stations up to 1500 miles distant and thru schedules a great many messages have been handled during the past season.

8VY, Kalamazoo, Mich,

Station 8VY, belonging to F. M. Louwaert and F. N. Wright, is located at 1227 N. Burdick St., Kalamazoo, Mich., and is well known to a large number of amateurs. The C. W. signals of 8VY have been reported QSA in every district, on both coasts, Canada, Alaska, and ships at sea.

Believing that 10-watts didn't make quite enough noise, 8VY joined forces with 8CJU and together they put in a 50-watt bottle with high hopes of adding another soon. Almost everything else in the set has been made by the owners. Separate transformers are used for the filament and plate circuits, the plate transformer delivering 1100 volts. The rectifier is composed of twenty jars with aluminum and lead plates and "twenty-mule-team" borax giving lots of "kick" to the signals. The full allotment of necessary meters of Jewell manufacture are also included in the transmitter.

The antenna is a four-wire cage hung over an eight-wire counterpoise, and used for both transmitting and receiving.

The receiving set is of standard short-wave regenerative design but with spider-web coils substituted for the vario-coupler. Stations from all parts of the country have been heard.

As proof of the good DX this station has been doing, during the last operating season 1595 cards reporting the signals of 8VY have been received, 531 stations worked, and a large quantity of relay traffic handled.



THE OPERATING DEPARTMENT

(Continued from page 61)

"old spks" but only goes to prove that everybody flops for C.W. sooner or later.

WINNIPEG DIVISION

J. A. Gjelhaug, Mgr.

J. E. Maynard has been appointed assistant division manager for Saskatchewan and 4BV has been appointed district superintendent in his place. 4BV is reaching out in great shape, he claims he has been heard in Hawaii, thus reaching the ambition of most of the amateurs up here. 4BV says he will take traffic for Alberta as he works 9AC regularly. It looks as if we have a substantial and dependable route to the coast for this winter. 4CB or 4BV, 9AC, 9BD. 4AO of Moose Jaw is working on a small C.W. set. An amateur radio convention will be held in Saskatchewan on Thanksgiving Day. 4GB is beginning to do relaying and will only be going week-end nights. 4FN of Saskatoon will be open for relay traffic this winter. 4CP will be going on ½ k.w. spark. The Saskatoon Radio Club will have C.W. and phone this winter and will handle relay traffic. Many others in cities to the east are building sets for the winter, and it only remains for the Manitoba district to complete connections to

• *(Concluded on page 65)*



The following societies were affiliated with the A.R.R.L. September 15th: North Jersey Radio Association, Newark, N. J. (President, W. C. Cooper; Secretary, Chas. E. Huffman). Central Florida Radio Club, Winter Park, Fla. (President, C. J. Holdorf; Secretary, H. E. Cole). Sharon Radio Club, Sharon, Mass. (President, John P. Olson; Secretary, Donald Hewin).

Waukeesa Radio Amateur Club

New officers for the W.R.A.C. were elected September 20th as follows: Walter Fitting, president; Robert Lathrop, vice-president; Robert Golding, secretary; Newton Willis, treasurer and Wm. Cronch, Sgt. at Arms. Meetings are being held every Wednesday at which time interesting lectures are given. The club operates station 9BDD.

The following local traffic regulations have been adopted by the club:

7:00 A.M. to 4:30 P.M.—free air
12:15 P.M. to 1:30 P.M.—QRX for WHA
4:30 P.M. to 7:00 P.M.—Local work
7:00 P.M. to 8:55 P.M.—Reception on'y
8:55 P.M. to 9:10 P.M.—QRX for NAA
9:10 P.M. to 7:00 A.M.—DX traffic

Des Moines Radio Association

The *Radio Log* is the official organ of the D.M.R.A. and contains news of interest to its members. It's a snappy little paper and it should keep the club treasury well above water.

Philadelphia Amateur Radio Association

The P.A.R.A. held its first meeting of the fall on Thursday, September 21, 1922. at 1521 Columbia Avenue, which will be the permanent quarters in the future. The association was reorganized and new officers were elected, also a new constitution was adopted. The Board of Governors was elected as follows: L. M. Knoll, chairman; R. Kantrow, C. G. Benzing, H. Blacker, J. Mooney, E. V. Eckert and J. Rau. The following officers were elected: L. M. Knoll, president; J. S. Marsh, vice-president; W. B. Martin, secretary; H. C. Brooks, treasurer; and J. W. Forsyth, correspondence secretary.

A very good plan for helping the amateurs to keep out of trouble from interfering with the broadcasting stations was suggested and all members agreed to help this

plan along by making it a section of the constitution of the association. Plans were laid for a very active amateur winter in Philadelphia.

The P.A.R.A. would like to suggest to all persons, before making a complaint to government officials about interference from Philadelphia amateurs, to send in the complaint, backed by proof, to the Philadelphia Amateur Radio Association who will take up the complaint with the accused amateur. This will avoid many mistakes and trouble for all hands.

The association has changed its meeting dates to the first and third Thursdays of each month.

Harrisburg Radio Club

The H.R.A. has adopted the following traffic rules:

1. In order to give due consideration to the man who listens only to the radio telephone broadcasts, all amateurs operating transmitters will refrain from using same during a period from 7:30 P.M. until 10:00 P.M.

2. Licensed spark, C.W., or fone sets will have the air from 10:00 P.M. to 10:15 P.M. These stations will be arranged alphabetically by the Harrisburg Radio Club and the said transmitters will QST the number of messages they have to transmit. This is for the purpose of having them lined up on the evening's relays.

3. The period from 10:15 P.M. to 10:45 P.M. is for all spark coils only. During this time no rock crusher, C.W., or fone will answer if called. This is to give the spark coils the time to work each other without interference.

4. The period from 10:45 P.M. to 2:00 A.M. will be for the high powered stations only. Spark coils will absolutely stop sending at this time unless said coil wishes to talk with a high powered station.

5. The period from 2:00 A.M. until the succeeding afternoon at 4:00 P.M. will be turned over to every transmitter; in other words, free air.

6. From 4:00 P.M. until 6:00 P.M. the spark coils will be given an opportunity for local work (refer to article No. 3).

7. From 6:00 P.M. until 7:30 P.M. will be for high powered stations who wish to transmit to local amateurs, or any other work.

8. This shall apply for Sunday as well as week days.

Dakota Division A.R.R.L. Convention

The first Dakota Division Convention was held at Minneapolis on September 7th and 8th. The first day was devoted to registration at the Headquarters at the West Hotel, with a tour of the local stations in the afternoon. Business and technical sessions took place at the Engineering Building of the University of Minnesota. The following are the papers read during the several sessions.

Radio Frequency Amplification—D. C. Wallace, 9DR
Data on C.W. Operation—A. P. Upton, U. of M.
Transformer Design for C.W.—Prof. M. E. Todd,
U. of M.

A.C. Rectification for C.W.—H. R. Skifter, 9YAJ

The convention closed with a banquet on the night of September 8th.

Milwaukee Amateurs' Radio Club

The M.A.R.C., constituting the local section of the A.R.R.L., has resumed its activities after the summer lull. The annual election of members to the Board of Direction has been held and C. N. Crapo, District Superintendent, elected chairman, assisted by six other able amateurs. The Board appointed as officers: H. E. Wareing, president; E. T. Howell, vice-president; H. G. Fawcett, secretary; and various committee chairmen.

The first lecture of the season was entitled, "The Vacuum Tube as a Radio Detector and Amplifier," and was given by E. R. Stoekle, Ph D, Instructor in Radio, University of Wisconsin.

Technical Publication, Relay, Interference, and Membership committees will each be responsible for certain meetings of the month.

This organization has been in existence since January, 1917, and meetings are held in the Milwaukee Public Museum, Trustees' Room, at 7:30 every Thursday evening. A perpetual invitation is extended to the public.

Greenpoint Radio Assn.

The Greenpoint Radio Association has again opened for the season and plans are being made to obtain local quarters for the club where the DeForest receiving set can be installed. The club is being reorganized and a drive for members instituted. Membership is open to all who wish to have a

broader knowledge of radio. Anyone may call any Friday evening at 79 Eagle St., or write to Sec. H. W. Gerlach, 113 Oak St., Brooklyn, N. Y. All communications will receive prompt attention.

THE ROANOKE

(Concluded from page 45)

is criss-crossed by a maze of daylight communication routes, and every noon and all day Sundays the air is busy. Such an injection of the ol' A.R.R.L. pep hasn't been witnessed in many a day. Brother Gravely's boys have simply decided that they were going to make a name for themselves and they have got busy, built the stations, operated them, and have succeeded. Gentlemen of the Roanoke, to-day you lead the country, and we will say this: there's nothing we would so much like to do as to saw off from this job for a few months and move right down in your division and handle traffic with you. You are the kind of fellows we like to know.

Mr. Gravely, we congratulate you and your able assistants, sir. You have added a page to A.R.R.L. history.

K.B.W.

THE OPERATING DEPARTMENT

(Concluded from page 64)

Ontario. Let's have an All-Canada-Relay-Route this winter.

4CE has now been appointed assistant division manager for Manitoba and 4BG still holds the job as district superintendent. With these two "live-wires" at the wheel and the rest of the gang doing their best, we look for some good reports from there. A coast to coast All-Canada-Relay-Route is what we are after boys, and when we all put our shoulder to the wheel we can make her go.

No messages have been handled through 4EZ this month mostly due to the short transmitting range of the present spark set which is used at this station. Good work has been done though, through the summer months, as regular service has been kept up with 4DO, Straithclair, Manitoba, a distance of 150 miles, using only three Ford spark coils for transmission, all day time work. 4EZ will open a reliable route from 4CB and 4BV east to Winnipeg. Prompt service is expected to be rendered from 4EZ this winter when the tube set is in operation, as there are four brothers in charge who are all capable of handling the code up to thirty words per.



Strays



In the August columns of this department mention was made of the appointment of Sheldon G. Hagen as Amateur Deputy Radio Inspector, to supervise amateur activities in Seattle and vicinity. This report was abstracted from the columns of a Seattle newspaper, but Radio Inspector O. R. Redfern has requested that we deny it, explaining that no such appointments have been made nor can be made until the Department of Commerce, which is now considering the matter, issues the proper authority to the Inspectors. We regret our inaccuracy.

It is with deep regret that we learn of the death of Glenn Phillips, 2BJF, on August 9th. He was only nineteen years of age and built and operated 2BRB, one of the best 2nd district stations with his friend Edward Glaser. Phillips had a reputation as not fearing any kind of "juice," being able to hang onto a 1000-volt line like it was only 110. His death came about thru a peculiar accident. While in bathing a high speed motor boat got out of control and Phillips was struck by the propeller, being severely injured. He was rushed to the hospital and everything done to save his life but blood poisoning set in and he passed on. CUL, 2BJF.

Wonder if 4GL realizes what he is responsible for. Some nights we hear more fast and rotten sending in ten minutes than we used to hear in a full evening before the war.

In the radio-frequency amplification circuits shown in the leading article in September QST, results can be improved by connecting a small fixed mica bypassing condenser (about .0005 mfd.) between the arm of the stabilizing potentiometer and one side of the "A" battery.

With the adjournment of Congress, consideration of the radio bills now pending goes over until Congress convenes again in December.

The Department of Commerce announces the preparation of new lists of radio stations. A list of commercial and govern-

ment stations, including broadcasting stations, complete to June 30th, will be ready about Oct. 30th, and the amateur list about the same time or a few weeks later. X, Y, and Z stations will be in both publications. The price of the lists is 15 cents each (stamps not accepted), and the address is the Superintendent of Documents, Government Printing Office, Washington, D. C.

The T. M. had a Boiled Owl Party on Saturday night, Sept. 30th, and it was a big success. Starting at 10:30 P.M. the gang came on with a bang and honestly it was like old times. We completely forgot that there was such a thing as broadcasts to worry us and everybody had a lot of fun. The traffic total was surely boosted that night.

At 1AW the T.M. and Ye Ed carried on with "HP" and saw the sun considerably "over the hill" whereupon Y. E. flopped into the basket but "FS" was still pounding brass at 9:40 A.M. October 1st after about twelve hours of it. Hil 1AW and 1BGF copied every district that night, and no doubt many others did too. 6KA was QRK at 6 o'clock E.S.T., in full daylight, and 7ZO had been heard all night. (Did you notice that both are C.W.?)

9ZN has I.C.W.! Whodathunkit? Recently ZN's new set has been tearing up the ether along both coasts in good fashion, altho it is reported noorer than the spark in the states adjoining Illinois. The set is a 500-watter, with 600 cycles on the plate; antenna current on 200 meters, 11 amperes. 9ZN has not abandoned spark and is retaining both the 60-cycle sync and the 500-cycle sparks, which he contends are far preferable for indiscriminate traffic handling. The I.C.W. set will be used only for long-distance schedule work.

Fine business, Matty. You ought to hear it out here. We're only sorry to hear you say that you'll never use straight D.C. C.W., because, OM, we honestly believe it would be still better that way.

Common Savings

"How much am I bid for my spark set?
SOLD!!!"

L. Dutton is now Asst. Radio Inspector for the 9th district.

It doesn't take much of a typographical error to give a fellow a massage by radio.

Q Signals Brought Up to Date

Nail this on the wall of your shack if you don't know them.

QRM—I missed the last part; you were sending too fast.

QRN—Ditto.

QSR—I will take the msg but I don't guarantee delivery.

QTA—Repeat the msg and don't send so sloppy this time.

QRS—[Obsolete].

QSA—Your sigs are loud enough to hear without straining my ears.

—9BRE.

Detroit lost one of its pioneer amateurs by the death of Earl Merrow, 8UJ. The absence of his sine on the air is keenly felt among Detroit and DX men, and our sympathy is with his parents.

Old Betsy Is a Chopper New

When ere I push my sending key the broadcast hounds are sure. With pitch forks and with search warrants they c'mor at my door. They say I am a worthless pest, a nuisance and a bore.

Each evening finds them on the job from seven until two, and if I try to clear my hook, by heck they're in a stew. "The governor shall hear of this," "An outrage, I declare," "He made me miss a lecture on the come life of the bare." I dare not show my countenance in public places now; a bootlegger's a gentleman compared with me, they vow.

So farewell, Betsy, you are through, you're shoved clear off the lot. The broadcast gang has got our goat, but stop us they will NOT. A 50-watter clears my hook at seven, eight or nine. The yaps all think it's static, and the gang all say it's fine.

—Contributed.

2CKT was overheard asking 2BGW where he could get some Beverage wire for his new antenna.

As proof that QST is going to the dogs, we have only to state that at "Beep," as Lloyd Phelps, Asst. Ed., "stepped off" on September 18th. His lady love, formerly Miss Alice Parsons, also hails from Minneapolis. This leaves Charlie Service as the only single (and sensible?) one of the Headquarters gang, but (confidentially) Headquarters gang, but (confidentially) only the other day we saw him hide a badge bearing the inscription, "Flapper Inspector."

8BIQ says that connecting a small phone condenser across the binding posts P, and S, or P, and S, on the first audio-frequency amplifying transformer will reduce tube noises and static and "tones up" phone concerts.

Wouldn't It Be Wonderful—

If everybody was 2,000 miles from 2FP? If Reinartz would invent a *perfect* tuner that couldn't be improved?

If 2TS wasn't flapper-crazy?

If some folks wouldn't send while rocking in a rocking chair?

If 4GL would speed up?

If visitors didn't ask so many d. f. questions?

If QST would fit inside our note book at school.

If some of the gang would oil their keys instead of their hair?

If everyone had a private secretary to arrange their "Calls Heard" lists?

If everybody had a fist like 2TS?

If we never had to sleep?

Read 'em and Weep!

8BKE has been heard by 6EN, 6ZG, 6ZZ, 6BJT, 6AQT, 7JS, 7AAB, on one fifty-watter, worked 6XAD, and hears 6EN, 6KA, 7QD, 7LU and 7ZO.

8CZN, in Cleveland during Sept. heard on one tube, 6CP, 6EA, 6KA, 6TV, 6BOE, 6DA, 6JD, and 6XAD. The last four were heard on a small indoor aerial. 6EA used five watts when heard.

8AB (U. S., not French) logged 6KA, 6JD, 6BSA and 6XAD during September.

8AM on 100 watts has been heard south of the equator in the Pacific ocean.

8ZZ has been heard 320 miles west of Oregon.

7LU covers most of the U. S. with his 15 watts.

2BSC on one five-watter has worked 1CHJ, 1BUA, 3CG, 3OT, and 9AVA (St. Paul, Minn.) which is better than he ever did on spark.

2CEI with an amplifier tube fed from a spark coil has worked many stations in daylight up to 100 miles. Input, 4 watts.

4LP, using one 5-watter, has been heard in 39 states, Canada, and has worked Cleveland, Ohio, in daylight, with best DX to Ellendale, N. D., and 5NK, all with antenna current $1\frac{1}{2}$ to 2 amps.

5QI, Fort Worth, Texas, worked 7LU on phone using 5-watts and absorption modulation.

And last but not least, 6XAD, during some hot nights heard 8GP, 5HK, 9CDV, 2KF, 9BHD, 9FK, 3OT, 9DMH, 9DTE, 8AQF, 5UO, and has handled traffic with 4BF at St Petersburg, Fla., with two 50-watters in the transmitter and one receiving tube. Whole flocks of eastern stations have reported hearing 6XAD lately.

Calls Heard



HEARD DURING SEPTEMBER

Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls "double spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of an 8½" x 11" sheet.

(2) Arrange alphabetically thru each district, from 1 to 9, and then Canada, with no break between the districts, using commas to separate calls and parentheses around calls of stations also worked—as in examples below.

(3) The period covered by the report shall be so stated and shall be approximately from the first of one month to the first of the following month. All lists must be received by us the 8th of the following month for publication in the next QST.

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner and then make a second paragraph in identical form listing the C.W. stations. Commercial calls will not be published.

Now that everybody knows how to do it, let's have a better grade of lists with some real DX and fewer nearby calls. However, be absolutely sure of the calls you log and report.

Heard by 6EX from New York to San Diego (1 tube)

Sept. 11 (120 miles south of New York) Spark: 8EW, 8BDA, 9UH, 9BYA. C.W.: 1RBW, 1CHJ, 5KC, 8VQ, 8VY, 8BGG, 8NU, 9NX, 9BBF, 9DKY. Sept. 12 (850 mi. S. of N.Y.) Spark: 1CDM, 8EW, 8BDA, 9ZN. C.W.: 1FB, 2ALN, 4BF, 4FT, 5ES, 5KC, 8AQO, 8CMI, 9II, 9ZV, 9APS, 9AWN. Sept. 13 (615 mi. S. of N.Y.) C.W.: 8AB, 8WL, 8WR, 8AQO, 9II, 9NX. (768 mi. S. N.Y.) C.W.: 8AAU, 4JK, 4NV. Sept. 14 (815 mi. S. N.Y.) Spark: 1CNI, 2AD, 2OM, 4BS, 8BDA, 9ZN. C.W.: 1FB, 1BBS, 1BQA, 2BML, 2BSC, 3FS, 3OD, 3TA, 3ALA, 4BS, 4EA, 4NT, 8OK, 8AIO, 8AQO, 8BLA, 8CDZ, 8CJH, 8CUR, 9OX, 9AJH, 9DYN. Sept. 15 (1080 mi. S. N.Y.) Spark: 2OM, 8BDA, 9ZN. C.W.: 1AJP, 8NU, 2ALN, 3BLF, 4FT, 4NT, 4ST, 4TU, 5ES, 5WC, 5ZA, 5VQ, 8VY, 8WR, 8AIM, 9II. Sept. 16 (1500 mi. S. N.Y.) C.W.: 4BF, 9IU. Sept. 17 (1750 mi. S. N.Y.) C.W.: 4BF. Sept. 18 (At anchor, Cristobal, Canal Zone) C.W.: 4BF, 5EQ, 5ZT. Sept. 19 (Off Cape Malai), Pacific Coast, Spark: 2OM?, 9ZN. C.W.: 1AJP, 4BF, 4GH, 8AFD. Sept. 24 (1789 mi. from San Diego) C.W.: 2FP, 4BQ, 5BE, 5PX, 8WR. (Several spks. in but lightning storm makes it impossible to copy any spk. sigs.) Sept. 25 (1450 mi. from San Diego) C.W.: 5DI, 6JD. (1200 mi. from San Diego) Spark: 5HD. C.W.: 5KC, 5QI, 9YX, 9AWM. Sept. 26 (1200 mi. from San Diego) C.W.: 2FP, 5ST, 6BES. Sept. 27 (1000 mi. from San Diego) Spark: 6KE, 8BDA, 8CMI, 9RW, 9AMK, 9DGW. C.W.: 2FP, 2GK, 6ZF, 6AJH, 6BES, 8BOX.

8CGX, 9ZN, 9ZAF. Sept. 28 (770 mi. from San Diego) Spark: 6AAU. C.W.: 5CY, 5VY, 5ZA, 6CP, 6ZF, 6AHR, 6AVD, 6BEG, 6BJQ, 6BOE, 9ZAF. Sept. 29 (455 mi. from San Diego) Spark: 6AO, 6QR, 8BDA. C.W.: 2FP, 5ZA, 6EN, 6ZF, 6BJY, 8BKR, 9DX, 9AWM, 9DPL, 9ZAF. (275 mi. from San Diego) Spark: 6AQU, 8ZE, 9PN, 9DHL. C.W.: 5ZB, 9AMB, 9DTM. Oct. 4th (Alongside dock at San Pedro, Cal.) C.W.: 4LX, 5XD, 5ZA, 7TQ, 9PS, 9ANQ, 9AWM, 9CNS, 9DSM.

7BJ, Aboard WSR

Sept. 3 (At Chignik Alaska) C.W.: 6KA, 6BOE, 6ARB, 6BMN, 6ZX, 6FF, 6TH, Can. 9AC, Spark: 7BK. Sept. 4 (15 mi. from Chignik) C.W.: 6KA, 6ZS, 6ZX. Spark: 6AHF, 6AJH, 7IW, Can. 9BD. Sept. 5 (1450 mi. from NPE) C.W.: (still daylight) 9AVZ, 6ZX, 7ZO, 6NX, 6ARB, 6ZS, 6ZF, 6ROE, 6BPU, 6BQC. Spark: 6CC, 6ACR, 6AJH, 6AHF, 7UF, 6ALD, 6AAU, Can. 9BD. Sept. 6 (1800 mi. from NPE) C.W.: 6BQC, 6BEG, 6FH. Spark: 7UF, 6ACR, 6AHF. Sept. 7 (1180 mi. from NPE) C.W.: 6BOE, 7IY, 6ZX, 6ZF, 6BJQ. Spark: 7UF, 6UP. Sept. 8 (1025 mi. from NPE) C.W.: 6ZF, 6KA, 6BOE, 7MF, 6AAT, 6BQC, 6ZB, 6EN, 6BEG. Spark: 7UF, 7ABS, 6AHF, 6ACR, 6VX, 6QR, Can. 9BD. Sept. 9 (720 mi. from NPE) C.W.: 6CU, 6OP, Can. 9AC & 9BD. Spark: 6AJH, 7ZK, 6ACR, 6AQU, 7UF. Sept. 10 (610 mi. from NPE) C.W.: 5FX, 6ABX, 6ZS, 7IY, 7AEA, 9AYS, 9BBF, 9BUG, 9DPL, 9DVI, Can. 9AC. Spark: 6ACR, 6AQU, 6AJH, 6ZQ, 6AMM, 6AAK, 7NW, 7BZ, 7ZK, Can. 8EC & 9BD. Sept. 11 (575 mi., early a.m.) C.W.: 5BE, 5DI, 5SF, 6BJY, 6BQG, 6GX, 9AYS, 9DPL. No Sparks. Sept. 11 (530 mi. from NPE, p.m.) C.W.: 4BF, 6BJ, 6KR, 6KA, 6ASJ, 6BJQ, 6BQG, 9DVI, 9BHD, 9BBF, 9AUS, 9BBJ, 9AWM, 9PS, 9BSC, 9YAJ, 9AJH, 7AD, 7NJ, 7EQ, 7LU, Can. 9AC. Sept. 12 (410 mi. from NPE) C.W.: 5RE, 5DI, 5PX, 5ZA, 6BJQ, 7JW, 7LU, 8AH, 9ARZ, 9BED, 9CEJ? funny stat, 9LZ, 9FI, 9NX, Can. 4EV. Sept. 13 (320 mi. from NPE) C.W.: 4BF, 5BE, 5PX, 5VA, 5ZA, 5ZAV, 5's too numerous, 8KO, 8ZZ, 8CUR, 9AFB, 9AON, 9NX, 9DX, 9DQ, 9EI, 8CNS, 9DPL. Sept. 14 (192 mi. from NPE) C.W.: 5ZA, 9AON, 9DBS, Can. 4EV bad QRN. Sept. 15 (170 mi. from NPE) C.W.: 5BE, 5UO. All above extract from Log. Write if interested.

Can. 4DY, Winnipeg, Man.

Spark: 7WG, 7ZU, 7ZV, 8ANU, 8ZY, 9ARG, 9ATV, 9AUA, 9AYW, 9AZA, 9AZF, 9BMN, 9BWB, 9DFX, 9CTW.

C.W.: 1CY, 4BQ, 5LB, 5NV, 5ZA, 5ZG, 5ZH, 6ZM, 8AB, 8ACH, 8AFY, 8AIM, 8AMM, 8ASY, 8AXN, 8BCY, 8BFX, 8BO, 8BVR, 8BWA, 8CDZ, 8CMY, 8CUR, 8IB, 8KG, 8QK, 8UE, 8ZJ, 8ZZ, 9AAP, 9AJH, 9ALW, 9AMI, 9AMU, 9ANQ, 9AOC, 9AON, 9AOU, 9APW, 9AQR, 9AQM, 9ARZ, 9ASD, 9ASN, 9AUA, 9AWM, 9AYS, 9BBF, 9BCH, 9BCF, 9BED, 9BEY, 9BFG, 9BGH, 9BHD, 9BJV, 9BJY, 9BKP, 9BSG, 9BZI, 9CFI, 9CGD, 9CMK, 9COA, 9CPE, 9CTW, 9DHL, 9DCT, 9DGE, 9DGM, 9DHB, 9DJB, 9DJM, 9DKY, 9DPL, 9DSM, 9DYN, 9DZQ, 9DXN, 9DR, 9GL, 9II, 9IY, 9KP, 9LZ, 9MP, 9NU, 9NX, 9QF, 9QR, 9UC, 9UU, 9XAC, 9YAJ, 9YX, 9ZAF. Canuc—3BF, 4BV, 4GB.

Canadian 3OH, Toronto

C.W.: 1ABY, 1AGI, 1AJE, 1AJP, 1ANQ, 1ARY, 1AZL, 1BRC, 1BWJ, 1CHJ, 1FB, 1GV, 1PY, 1QP, 2AKE, 2AFP, 2AUZ, 2AWF, 2AWS, 2AYV, 2BAY, 2BRB, 2BSC, 2BUU, 2CFI, 2CHG, 2FP, 2GK, 2QF, 3RY, 2SN, 2UD, 2WB, 3AAO, 3AAY, 3ACJ, 3ACE, 3ALN, 3AQH, 3AQR, 3AAU, 3BG, 3BGT, 3BHM.

1PT, 1PY, 1QN, 1QP, (2SC), (1SD), 1UJ, 1YK, 1ZE, 2ACD, 2AFP, 2AJA, 2AVE, 2AYF, 2AZC, 2BBB, 2BDM, (2BQG), (2BRC), 2BSC, 2BTW, 2BUA, 2BUE, 2BYC, 2CBG, 2CBT, 2CEM, 2CIM, 2CJE, 2CNZ, 2DX, 2EL, 2FC, 2FP, 2MU, 2RB, 2SQ, 2TS, 2VA, 2WB, 2ABW, 3AC, 3ADT, 3ADX, 3AHN, 3AQH, (3AQX), 3AUU, 3AUW, 3BE, 3BEY, 3BG, (3BIJ), 3BIR, 3BJF, 3BMN, 3BMS, 3BNU, 3BRW, 3BTY, 3BUQ, 3BVA, 3BVL, 3BX, 3BZ, 3CDG, 3CG, 3ER, 3FR, 3FS, 3GC, 3GK, 3HG, 3HL, 3IL (3OE), 3OT, 3SM, 3TA, 3TJ, 3VW, 4BQ, 4DL, (4EA), 4GH, 4HW, 4JK, 4KC, 4NT, 4OI, 5EK, (5ER), 5ES, 5HK (5HL), 4NV, 5SM, 5ZA, 6XAD, 8ACH, (8ADH), 8AFD, 8AFY, 8AGR, 8AGO, 8AIG, 8AIM, (8AMM), 8AMS, 8AOB, 8AQF, 8ASV, (8ATU), 8AVL, 8AWM, 8AXB, 8AXN, 8AYH, 8BFH, 8BFM, 8BGL, 8BIQ, 8BKE, 8BKU, 8BLT, (8BMK), 8BNJ, 8BNU, 8BPH, (8BRM), 8BRQ, 8BRT, 8BTL, 8BTR, 8BVR, 8BWA, 8BXH, 8BXT, 8CAA, 8CBC, 8CDZ, 8CEI, 8CGN, 8CGU, 8CGX, 8CJH, 8CLD, 8CMY, 8CNP, (8CNW), 8CQL, 8CQX, 8CUS, 8CVE, 8ER, 8FT, 8IB, 8KG, 8OW, 8QK, (8SB), 8SP, 8UE, 8UP, 8WR, 8XE, 8ZAF, 8ZAG, 8ZQ, 8ZV, 8ZZ, 9AFN, 9AIY, 9AJH, 9APS, (9ARK), 9AUA, 9AWF, 9AWM, 9AYS, 9BAK, 9BCB, 9BDS, 9BHQ, 9CAH, 9CBA, 9CGK, 9CEI, 9DGB, (9DPL), 9DQU, 9DTJ, 9DUG, 9DYN, 9EL, 9EJ, 9IL, 9IO, 9LQ, 9UC, 9VK, 9VZ, 9WS, 9XAC, 9XL, 9ZAA, Can (8BG), (8BV).

3CA, Roanoke, Va. (All C.W.)

1ACG, 1AJP, 1AZW, 1BRS, 1CCZ, 1CJH, 1CPN, (1CQW), 1QN, 1RD, 2AER, 2AFP, 2AGC, 2AYV, 2BQB, 2BRB, 2BRC, 2CBG, 2CBJ, 2CJE, 2DAW, 2EL, 2NZ, 2WB, 3AFB, 3AJD, 3ALN, (3APR), 2AQB, 3AQR, 3AUU, 3BG, 3BGT, (3BIJ), 3BLF, 3BNU, 3BRW, 3BVA, (3BVL), 3BV, 3FS, (3HL), 3IW, 3MB, 3OT, 3QV, 3SM, (3TJ), 3VW, 3ZV, 3ZZ, (4BX), 4BY, 4DC, 4DS, (4EA), 4EB, 4EH, 4FO, (4FT), 4GH, (4GK), 4GX, (4HW), 4II, 4JK, 4JY, (4LJ), 4NT, 4NV, 4ZF, 5EG, 5ER, 5FV, 5HL, (5KC), 5LX, 5UK, 5XA, 5ZA, 8AB, 8ACH, 8AFD, 8AIM, 8AKP, 8ALF, 8ALP, 8ANB, 8AQF, 8ASV, 8ATU, (8AUE), 8AWP, (8AWZ), 8AX, 8AXB, 8AXN, 8BCL, 8BDO, 8BDU, 8BFM, 8BGC, 8BHO, (8BJV), 8BMN, 8BNJ, 8BNT, 8BOZ, 8BPL, 8BPU, 8BRM, (8BRT), 8BVM, 8BUN, 8BUX, 8BVP, 8BVR, 8BUT, 8BWA, 8CAY, 8CDZ, 8CEI, 8CGP, 8CI, 8CJY, 8CKM, 8CNJ, 8COY, 8CUR, 8CUS, 8CZC, 8DV, 8HJ, 8HM, 8IB, 8JU, 8KG, 8LT, 8OW, 8PT, (8QK), (8SB), 8UE, 8UP, 8XE, 8XN, 8ZAE, 8ZAF, 8ZZ, 9AFN, 9AFT, 9AJH, 9AOU, 9APH, 9APR, 9APS, 9ARZ, 9AUU, 9BHD, 9BJY, 9CMK, 9DPL, 9QUU, 9DXN, 9DYN, 9DZY, 9GL, 9JH, 9LJ, 9NU, 9NU, 9OX, 9QB, 9UU, Canadians 3BV, 9AL.

On "Super," one tube, no aerial, ground or loop: 1FB, 2NZ, 3BHJ, 3LR, 4BX, 4FT, 4GH, 5KC, 5EK, 8BUM, 8BV, 8DAK, 8ZZ, 9AFS, 9BED, 9BPV, 9KP, (9LQ), 9UU, 9UY. With loop: 2COL, 3AAO, 3BVA, 4EA, 4NV, 8ACF, 8BFM, 8BVR, 8CJH, 9ARR, 9AUA.

Daylight: (3APR), (3BZ), (3HL), 4GK, 4ID, 5EK, 8BDU.

3TF, Ruxton, Md. (1 tube)

Spark: 1BPZ, 2AIM, 2AJE, 2ARB, 2OA, 2PF, 2OM, 3AN, 3AM, 3BMO, (3BRA), (3SF), 4BL, 5XA, 8ACF, 8AFG, 8AJT, 8BBO, 8BEP, 8BDA, 8BRL, 8CH, 8COA, 8EB, 8EO, 8EW, 8KY, 8UC, 8ZY, 9AGR, 9AIR, 9AMK, 9ARK, 9AZA, 9BRS, 9CF, 9DEN, 9DWM, 9MC, 9TL, 9ZN.

C.W.: 1ABY, 1AGI, 1AJP, 1AJU, 1AR, 1ASF, 1AUN, 1BEO, 1BGF, 1BUA, 1CEC, 1CGO, 1CHJ, 1CPN, 1DV, 1HK, 1PY, 1XP, 1ZE, 2AER, 2AFP, 2AWF, 2AWS, 2AZC, 2BBB, 2BQU, 2BYC, 2CBC, 2CJE, 2COL, 2CQZ, 2EL, 2FZ, 2GK, 2DX, 2HW, 2IG, 2TS, 2TT, 2RY, 2VA, 3AAY, 3AC, 3AHK, 3AHN, 3AHP, 3AKA, 3ALN, 3ANZ, 3APR, 3AQR, 3BHL, 3BLU, (3BN), 3BNU, (3BSJ), (3BWI), 3CAG, 3CG, 3FS, 3GV, 3IW, 3PZ, 3TJ, 3TN, 3WF, 3XAA, 3ZZ, 4BQ, 4BY, 4CQ, 4CX, 4DC, 4EB, 4EN, 4EL, 4GH, 4HW, 4ID, 4JY, 4KC, 4KU, 4LZ, 4NT, 4NV, 4NX, 5EK, 5FV, 5KC, 5PX, 5SK, 5XAD, 8AB, 8ACG, 8ADH, 8ADT, 8AFB, 8AFD, 8AFT, 8AFY, 8AG, 8AGO, 8AHA, 8AIM, 8AKP, 8ALF, 8ALT, 8AOB, 8ANB, 8ATV, 8AVL, 8AWM, 8AWZ, 8AXB, 8AXN, 8AZH, 8BCY, 8BOD, 8BDO, 8BEO, 8BF, 8BFM, 8BFX, 8BGG, 8BHO,

8BJC, 8BJX, 8BKE, 8BMK, 8BNU, 8BOZ, 8BOQ, 8BPN, 8BQF, 8BRM, 8BRT, 8BSJ, 8BTR, 8BVR, 8BVT, 8BWA, 8BWK, 8BUN, 8CAK, 8CAU, 8CDZ, 8CEF, 8CGM, 8CGP, 8CGU, 8CGX, 8CID, 8CIX, 8CJH, 8CJY, 8CJZ, 8CKO, 8CNP, 8CNW, 8CON, 8CPX, 8CTN, 8CZC, 8CUU, 8DAK, 8DV, 8HJ, 8JG, 8JU, 8KG, 8ML, 8MZ, 8PT, 8QI, 8SB, 8SF, 8SP, 8UE, 8XE, 8ZAF, 8ZE, 8ZZ, 8ZAE, 9AAP, 9AON, 9ARG, 9BDS, 9BED, 9BSG, 8BTT, 8BUP, 9BZI, 9CCS, 9CFI, 9CGK, 9CIE, 9DLG, 9DPL, 9DQU, 9DXN, 9FK, 9GL, 9IO, 9LQ, 9OX, 9ZN, 9YAJ, Can. 3BV.

3ADI, 659 N. Markoe St., West Phila., Pa.

Spark: 1CNI, 2AJE, 3ASV, 5BR, 8BDA, 9UH.
C.W.: 1GV, 1UJ, 1CNR, 2CM, 2RF, 2VA, 2ACY, 2AVZ, 2AWS, 2BMR, 2CBG, 2CDG, 2CGJ, 3CO, 3NZ, 3TJ, 3AHN, 3BHM, 4GL, 4GX, 4IZ, 5ES, 5HD, 6KA, 6ZF, 8AB, (8HJ), 8IB, 8MZ, 8RG, 8SE, 8SR, 8UE, 8UP, 8VY, 8XJ, 8ABO, 8ACS, 8ACU, 8AGX, 8AJT, 8AMM, 8ANB, 8ASV, 8ASZ, 8AVL, 8AWF, 8AWZ, 8BDO, 8BFH, 8BFR, 8BPL, 8BPR, 8BPU, 8BVR, 8CEF, (8CEI), 8CGN, 8CKO, 8CMY, 8CNW, 8CTP, 9EI, 9II, 9OX, 9UU, 9XF, 9XL, 9AIY, 9AON, 9API, 9APS, 9AXF, 9BJY, 9BRL, 9BTK, 9CNC, 9DGG.

4HS, Atlanta, Ga. (One tube)

Spark: 1AW, 2EL, 2FP, 2GN, 2OM, 3AOV, 3ARN, (3AWF), 3BVC, 3GO, 4BC, 4EL, 4FB, (4FD), (4GN), (4IE), (4SK), (5BW), 5DI, 5EK, 5ER, 5FJ, (5JF), (5MO), 5TU, (5UC), (5XA), 5XAC, 5XU, 5ZAS, 5ZL, 8AFD, 8AIB, 8AIT, 8AIZ, 8ANB, (8AWU), (8AXB), 8AXN, (8AZF), (8BBU), (8BDA), 8BDB, (8BDV), 8BEP, 8BEW, 8BFM, (8BO), (8BXC), 8BXS, 8BYO, 8CKV, 8CO, 8CYU, 8EB, 8EOD, 8FT, 8KJ, 8RQ, (8UC), 8VR, (8WZ), 8YN, (8ZE), 8ZO, 9AAW, 9AAP, 9AFK, 9AIR, 9AJB, (9AMK), 9AOJ, 9AOR, 9APR, 9APS, (9AQA), 9AZA, 9AZF, 9BMN, (9BWS), (9CP), 9DAW, 9DIJ, (9DWM), 9DWF, (9DWX), 9DXN, 9DZE, (9DZY), (9FK), (9GX), (9LF), 9MC, 9OX, 9PE, 9PN, 9PG, 9PD, 9RR, 9TL, (9UH), (9ZN).

C.W.: 2FP, 3BVI, 3ZZ, 4BF, 4BQ, 4BX, 4BY, 4CX, 4DC, 4FA, (4EB), 4EN, 4EL, 4FS, 4FT, 4GE, 4GK, (4GX), 4HZ, 4IV, 4JK, 4KC, 4KI, 4LJ, 4MN, 4NI, 4NT, 4OD, 5AAR, 5BAA, 5EG, 5FV, 5HB, 5HL, 5UK, 5BDB, 5BFM, 5BKE, 8SP, 8UC, 8ZC, 9ABV, 9ABY, 9IO, 9LQ, 9APS, 9AWF, 9ZNI.

4IZ, Tampa, Fla. (One tube)

C.W.: 1ARA, 1RL, 4AE, 4BB, 4BD, 4BQ, 4BV, 4BX, 4BY, 4EA, 4EB, 4EH, 4EL, 4FT, 4FH, 4FW, 4GH, 4HW, 4KC, 4KU, 4LA, 4LH, 4LJ, 4LW, 4NP, 4NV, 4OD, 4OI, 5BI, 5EH, 5FV, 5HL, 5KC, 5PQ, 6EE, 8BDU, 8IB, 8SB, 8SP, 8ZZ, 9AL, 9AON, 9APS, 9ARR, 9UU, Can. 4CB.
Spark: 4BC, 4BI, 4FD, 5XA.

4FT, Wilmington, N. C.

(1AJP), (1AM), (1AZW), 1BBS, (1BBW), (1BEO), 1BGF, (1BKQ), (1BQI), (1BRQ), 1BUA, (1CCZ), 1CFE, (1CLI), (1CTW), (1FB), (1GV), (1QN), (1QP), (1QV), (2AFP), (2AJA), 2ALF, 2AMA, 2ANO, 2AV, (2AYV), (2BDU), 2BQD, 2BQU, (2BRB), 2BRC, 2CBG, (2CES), (2CFB), (2CMS), (2EL), (2FP), (2GK), 2IG, (2KL), (2NZ), (2TS), (2VA), 3AAO, 3AC, (3AEV), (3AFB), (3AQR), (3AUU), 3BA, (3BHM), (3BLJ), (3BIT), 3BJY, (3BLF), (3BMN), (3BNU), 3BOB, (3BRC), (3BTY), (3BUC), (3BUT), (3BVA), (3BVL), (3BZ), (3CA), (3CAN), 3CBM, (3CC), (3FS), (3IW), (3PZ), (3QV), (3RF), (3VW), (3WB), (3ZW), 3ZZ, (4BF), (4BO), (4BY), (4DC), 4DS, (4EA), (4EB), (4EH), (4EL), (4EN), (4GH), 4GS, 4GX, (4HW), (4JK), (4JY), (4KT), (4LJ), (4NT), (4NV), (4OI), 5EG, (5EK), 5ER, (5ES), (5FV), 5HB, (5HL), 5KC, 5NV, (5OA), (5RH), (8ACH), 8AES, (8AFD), (8AHR), (8AIG), (8AIM), (8AIO), (8AJT), 8ALF, 8ALT, (8AMM), 8AMS, 8ANB, (8AOB), 8AQF, (8ASV), 8ASZ, (8AVL), (8AWN), (8AWZ), (8AXC), (8BDB), (8BDO), 8BDU, 8BF, (8BFM), (8BFT), 8BFX, 8BGG, (8BHO), (8BJC), (8BJK), (8BJY), (8BJX), (8BKN), 8BKU, 8BN, (8BO), 8BOZ, 8BPL, 8BQF, (8BRM), 8BRT, 8RSS, 8BTR, 8BUN, 8BUX, (8BVT), (8BWA), 8BZY, (8CAZ), (8CBX), 8CDZ,

(8GPF), (8GHI), (8GEU), 8GPF, 8CGX, (8CJY),
(8OKO), 8CMY, (8CUR), 8CUS, (8DAK), (8FT),
8HJ, (8H), (8HG), (8LF), 8OM, 8OW, 8QG, (8SP),
8UE, (8UK), 8VQ, (8VY), (8WR), 8ZA, 8ZAE,
8ZL, (8AAP), 8AK, (8AJH), 8AON, (8APS),
8ASE, 8AWF, 8BCB, (8BDS), 8BED, (8BEH),
8BHD, 8BHL, (8CF), 8DCG, 8DTJ, 8EL, (8II),
8G, (8JG), (8LQ), (8OX), 8PS, (8UC), 8UH,
(8UU).

EXAC, Conway, Arkansas

Q.W.: 4BQ, 4GH, 4KC, (4MNE), (4SDI), 4SDO
 5DW, (4SED), 5EG, (4SEK), 5FV, 5HB, (5IIE)
 (5JBE), (5KSC), 5LA, 5LB, (5NS), 5NV, (5PX)
 (6QI), (6QS), (6RJ), (6SF), 6SO, (6SM), (6UK)
 (6UC), 6VA, (6XAB), (6XAD), (6XV), 6ZA
 (6ZAY), 6ZZ, 6ZH, (6ZG), 6AJ, 6KA, 7LU
 (8AOT), (8BVA), 8UE, (8VY), (8ZE), (8ZAF)
 8ZZ, 9AAU, (9AMO), (9ABV), (9ANQ), (9AOG),
 9AOM, 9AOU, (9APW), (9APS), (9ARK), 9ARR,
 (9AUA), 9AWM, (9AYM), (9AYS), (9BDS)
 (9BED), (9BGH), 9BSG, (9BZI), (9BIT), 9JJS,
 (9OOT), (9DNT), (9DHB), (9DR), (9DSG), 9DXD,
 (9DUG), 9EL, 9IL, 9NU, (9OX), (9PW), (9YAJ),
 9XAC, 9ZAF.

9Bart. 1FP. (3AHK) 4BL (4HX). (5ABY).
 (5AEX). (5BW). (5CR). (5EA). 5FL (5FL).
 5HQ. (5HZ). (5JFY). (5MO). (5NS). 5OL
 (5QI). (5QS). (5RO). (5RH). (5SM). 5TC. 5TG.
 (5TM). (5TP). (5TU). (5UC). 5UD. (5WE).
 (5WF). (5WW). (5XA). (5XB). (5XAB). (5XAD).
 5XAL (5ZAE). (5ZAW). (5ZL). (5AWU). (5AL).
 (5BDA). (5CMI). 5UC. (5KJ). (5ZY). 5AEG.
 (5AFK). (5AIU). (5AIR). (5ARG). (5ACLI).
 (5AYW). (5ARX). (5AZA). (5ANO). 5EAB.
 (5BMN). (5BDR). (5BKK). (5BWS). (5HXC).
 (5BTZ). (5CA). 5CKP. 5DCW. (5DMJ). (5DQQ).
 (5DSD). (5DZY). 5DXC. (5FK). (5KA). 5LF.
 5MC. (5OX). 5PA. (5PE). (5RE). 5WT. 5XT.
 5YB. (5YM). 5ZN. (5ZY).

SDI, T. S. Depew, 2209 Azle Ave., Ft. Worth, Texas

C.W.: (4EB), 4EZ, 4KP, 4ZF, 5AC 5BM, 5CY,
5DW, (5EH), (5EK), (5EL), (5ES), (5HV),
5IX, (5JB), 5JW, 5KC, 5ME, 5NS, 5RR, 5RX,
(5QS), (5SM), (5UY), 5AAW, 5AEJ, 5ACF, 6CP,
(6JD), 6KA, (6AVD), (6WU), (6AWT), 6BOE,
(6BSA), 7LU, (8IB), 8SP, (8SB), 8UI, 8VY,
(8Z), 8AIM, (8ADT), (8AKP), 8ALL, 8ANB,
8AUL, 8AXB, (8AXN) 8BCY, 8BKE, 8BRR,
8BTL, 8BTR, 8CKK, 8GQX, 8DIF, (9EI), 9FM,
9IL, 9LL, 9OE, (9OX), 9UU, (9ZL on fone),
(9ABU), 9AES, 9AJP, 9AJS, (9ALY), (9AMB),
9ANQ, 9ANS, 9AOU, 9API, 9APS, 9APW, 9AQL,
(9AQM), 9AQQ, (9ARR), (9ARZ), 9AUA, (9AUS),
9AVN, 9AWN, 9AYS, 9BBF, (9BCF), 9BDS,
(9REP), 9BJU, 9BJV, 9BOA, (9BSQ), (9BTT),
(9BWK), (9BXT), (9CFI) 9CJI, 9CJJ, 9CTR,
9DAH, (9DAM), 9DBL, (9DQU on fone), (9DSM),
(9DXD), 9DXT, 9DZQ, (9XAC), (9ZAA), (9ZAF),
9IF

5ADL, 001 Asia St., Baton Rouge, La. (1 tube)

C.W. : 1AJP, 2FP, 3BVC, 3BZ 3LR, 3MK, 3ZZ,
 4AU, 4BF, 4BQ, 4BY, 4DC, 4EA, 4EB, 4EH, 4EL,
 4FT, 4GH, 4GK, 4HW, 4ID, 4JK, 4JY, 4KF, 4KU,
 4LJ, 4ZF, 5AAM, 5ABA, 5ABM, 5ACF, 5ADE,
 5AE, 5BE, 5BM, 5BQ, 5CY, 5DG 5DL, 5DW, 5DY,
 5ED, 5EK, 5ER, 5ES, 5FV, 5HB, 5HL, 5IG, 5IV,
 5JB, 5IX, 5JL, 5JM, 5KC, 5LB 5MA, 5ME, 5MG,
 5ML, 5NN, 5PX, 5QL, 5QS, 5RJ, 5SF, 5SK, 5SM,
 5SR, 5UK, 5UN, 5UO, 5VA, 5VO, 5VY, 5XAD,
 5XAE, 5XV, 5XY, 5ZA, 5ZH, 5AR, 5AFD, 5AFY,
 6AIO, 6ANB, 6AQO, 6AWZ, 6AXE, 6AXC, 6AYC,
 6AZH, 6AZO, 6BCY, 6BDZ, 6BDU, 6BFM, 6BFX,
 6BGG, 6BHD, 6BKE, 6BPL, 6BRQ, 6BRV, 6BWA,
 6BZY, 6CDZ, 6CEI, 6CF, 6CGM, 6CGX, 6CLD,
 6CMI, 6CJR, 6CYT, 6DAK, 6FT, 6KG, 6SB, 6SP,
 6UK, 6UZ, 6VQ, 6VY, 6XJ, 6ZAF, 6ZZ, 9AAP,
 9AAU, 9ABV, 9ACI, 9AFN, 9AJH, 9AJP, 9AMB,
 9AMI, 9ANQ, 9AON, 9AOU, 9APJ, 9AQM, 9AQR,
 9ARK, 9ARR, 9ARZ, 9ASD, 9ATU, 9AUA, 9AUS,
 9AVM, 9AWF, 9AWM, 9AYS, 9BBF, 9BCB,
 9BCF, 9BDS, 9BED, 9REY, 9RGH, 9BHD, 9BHI,
 9RHN, 9BJY, 9BKE, 9BKP, 9BLO, 9BMN,
 9BRI, 9BSQ, 9BVP, 9RXT, 9BZI, 9BZZ, 9CCM,
 9CCS, 9CVC, 9CRI, 9CFY, 9CGK, 9CI, 9CJJ, 9CMK,
 9CF, 9CFB, 9DCR, 9DGG, 9DHB, 9DJB, 9DJD,
 9DKY, 9DPL, 9DQU, 9DR, 9DSB, 9DSM, 9DTJ,

9DUN, 9DWK, 9DXD, 9DXN, 9DYN, 9DZQ, 9DZY,
9FM, 9HI, 9IO, 9KP, 9LQ, 9LZ, 9NU, 9NX, 9OX,
9PA, 9PS, 9UC, 9UU, 9WA, 9YAJ, 9ZAA, 9ZAF,
9ZZ, Can. 9XAC.

Spark: 4BI, 4FD, 5AAT, 5AO, 5BW, 5BI, 5HZ, 5JF, 5MO, 5OI, 5QS, 5RF, 5TM, 5TU, 5UC, 5XA, 5XAC, 5XAD, 5XB, 5ZAC, 5ZAI, 5ZC, 5ZL, 8BDA, 8BYO, 9AMK, 9DHz, 9DJB, 9DMJ, 9DWM, 9DZY, 9JX, 9LF, 9MC, 9OR, 9YAK, 9YM, 9ZN.

**6BVT, (portable) 6200-ft. elevation on Laguna Mt.,
(61 miles from San Diego, Calif.)**

C.W.: 5ZA, 5PL, 5QI, 5D?, 6BRK, 6AOZ, 6AT,
6TW, 6KA, 6BJY, 6ZB, 6ZX, 6APW, 6BPZ, 6AQA,
6RU, 6BJU, 6BOE, 6BFF, 6BJX, 6AMH, 7LU,
9PI, 9ABV, 9AMB, 9BP, 9ZN, 9CJJ, 9AJT, 9COS,
9DUG.

GAOR, Berkeley, Calif. (1 Tube)

G.W.: 5DI, 5JL, 5QI, 5ZA, 6BF, (6CU), (6EA),
6EB, (6PT), (6GX), 6GY, 6JD, 6EN, 6KA, 6AEH,
6AX, (6AJH), 6ALU, 6ANP, 6APW, 6AQW,
6ATC, 6BCT, 6BEC, 6BEG, 6BEQ, 6BIB, 6BKO,
6BJY, 6BLU, (6BPZ), 6BQF, 6BQP, 6BQZ, 6BUM,
(6BRK), 6BVQ, 6ZG, 6XAD, 6XAS, 6DB, 7IE,
7IY, 7LU, 7MF, 7NA, 7NF, 7OE, 7OT, 7QW, 7SC,
7SG, 7TG, 7ACK, 7AEA, 7AFW, 7AGX 7EB, 7WD,
8IB 8W, 8BCY vY 8QA, 8QAT, 8CB, 8DE, 8WD,
9AJA, 9ADS, 9AMB, 9AYU, 9AWP, 9AWM, 9COJ,
9DTM, 9ZN.

SAOW, 131 Sierra St., Riverside, Calif.
(Every District)

C.W.: 1ZE, 1CVJ, 2AKJ, 3SL, 4BF, 4BX,
4GV, 5BE, 5DI, 5KC, 5NB, 5NS, 5FX, 5QI, 5KX,
5XY, 5ZA, 5ZC, 5ZAV, 5AW, 6BJ, 6CC, 6CF,
6CU, 6EA, 6EB, 6EC, 6EN, 6FH, 6FT, 6GB,
6GX, 6GD, 6IU, 6JD, 6KA, 6KU, 6LK, 6LV,
6NX, 6OH, 6RD, 6RR, 6TW, 6UW, 6VR, 6XR, 6XJ,
6ZA, 6ZB, 6ZE, 6ZF, 6ZG, 6ZS, 6ZX, 6AAG,
6AAT, 6ABX, 6ACB, 6AEH, 6AGP, 6AGW, 6AHO,
6AIF, 6AIO, 6AIV, 6AJF, 6AJH, 6ALU, 6AOR,
6AOT, 6AOZ, 6APW, 6AQQ, 6AQW, 6ARB, 6ARQ,
6ARD, 6ATG, 6ATQ, 6ATU, 6AVD, 6AVU, 6AVV,
6AWG, 6AWP, 6AWT, 6XAD, 6XAS, 6BBC,
6BOD, 6BCJ, 6BCR, 6BCV, 6BEG, 6BEQ, 6BES,
6BFE, 6BIR, 6BJQ, 6BJR, 6BJX, 6BJY, 6BKO,
6BLA, 6BMD, 6BMP, 6BOC, 6BOD, 6BOO, 6BPP,
6BPZ, 6BQC, 6BQD, 6BQF, 6BQG, 6BQP, 6BQQ,
6BQZ, 6BRD, 6BRE, 6BRG, 6BRK, 6BUM, 6BZG,
7DP, 7LU, 7LY, 7MF, 7NA, 7NY, 7OZ, 7QD,
7QW, 7SC, 7SY, 7TN, 7XC, 7XG, 7YJ, 7ZB, 7ZO,
7ZU, 7AEA, 7AEG, 8WR, 8ZZ, 8ACI, 8ANU,
8AQD, 8ASV, 8BCY, 8BFM, 8BKE, 8BXS, 8BZY,
9EI 9FM, 9IN, 9NX, 9PI, 9UU, 9ZM, 9ABU,
9AEQ, 9AJA, 9AJW, 9AMB, 9AMI, 9ANF, 9APS,
9APU, 9APW, 9ARZ, 9AWM, 9AYS, 9XAC, 9XAQ,
9ZAF, 9BBF, 9BJV, 9BSG, 9BXU, 9BZZ, 9CFY,
9CNI, 9CNS, 9COW, 9CXC, 9DAE, 9DPI, 9DTE,
9DTC, 9DPI, 9DTM, Canadians 4RV, 5GS, 9AC

5G, 6G, 50TH, 51TH, Canadian, 4B, 5C, 5AE,
 5B, Spark, 5ZH, 6AO, 6AR, 6CC, 6FP, 6FH, 6GF,
 6G, 6GR, 6GT, 6HC, 6IC, 6J, 6AB, 6FC, 6KB,
 6KL, 6KA, 6OD, 6Q, 6QK, 6QR, 6OY, 6T,
 6UP, 6VA, 6VX, 6XU, 6ZQ, 6ZU, 6AA, 6ABU,
 6ARW, 6ACR, 6ADI, 6AEY, 6AEZ, 6AGK, 6ACT,
 6AHC, 6AHP, 6AHP, 6AHP, 6AHU, 6AIU, 6AHT,
 6AJU, 6AKL, 6AKT, 6ALA, 6AID, 6ALV, 6AMK,
 6AMN, 6AMW, 6AOR, 6APL, 6APV, 6AQS,
 6AQU, 6ARI, 6ARK, 6ARS, 6ACH, 6ATC, 6ATF,
 6ATU, 6ATV, 6AVB, 6AVV, 6AWH, 6AWX, 6BAB,
 6BAE, 6BAJ, 6BBV, 6BIC, 6BJG, 6BJU, 6BNV,
 6BPE, 6BQD, 6FI, 6FQ, 6JG, 6IW, 6MF, 6OH,
 6OT, 6TJ, 6VF, 6WG, 6YA, 6ZS, 6ZU, 6AEA,
 6ABS, CL-8.

6RR, 415 N. Gower St., Los Angeles, Calif.

C.W.: 2PR, 4BF, 4BV, 5FV, 5IL, 5KC, 5QI,
5QU, 5XY, (5ZA), 5ZH, 5XA^K, 6AK, (6AR), 6FH,
6GR, 6GX, 6IK, 6KU, 6NX, 6OH, 6PG, (6RD),
6UF, (6VZ), 6AAT, 6ABX, 6AJH, 6AHF, 6ATY,
6AKL, 6AOF, 6AQD, 6ARB, 6ARS, 6ATQ, 6AWT,
6BJD, 6BCK, (6BCJ), 6BGR, 6BIC, 6BIK, 6BIR,
6BJQ, (6BJY), 6BNV, 6BOE, 6BRD, 6BSA, 6BUH,
6BWE, 6XH, 6HJ, 6XT, 6ZB, (6ZF), 6ZS, (6ZX),
6ZAC, 6TH, 7DP, 7HS, 7JW, 7IC, 7IW, 7IU,
7MP, 7NJ, 7OZ, 7SC, 7TN, 7AEH, 7AFT, 7AFW,
7AHW, 7AIU, 7XC, 7LI, 7ZB, 7ZJ, 7ZO, 8B, 8UN,
8WR, 8ATF, 8ABR, 8AMG, 8BVT, 8XJ, 9DR,
9GK, 9UA, 9UU, 9WD, 9ABV, 9AGH, 9AJS,

BAMB, BAMS, BAOO, BAON, BAOT, BAPW, BAUA, BAWM, BAWN, BAYS, BAYU, BATA, BBED, BBIV, BBXA, BDAE, BDKB, BDRK, BDSM, BDTT, BDRV, BXAQ, BZAC, BZAF, BZAJ, BZAV, BZDM, BZCB, BZNG, BZII, BZCANADIAN, BZBD, BZAC, BZBV.

On Loop with 3 steps R. F. Amplification, Week of Sept 25th: 5KC, 5ZA, 5XY, 6AAF, 6APL, 6AVU, 6BFE, 6ZS, 7BS, 7OZ, 9AMB, 9AMS, 9BJV, 9UA, 9AGH, 9ZAF.

7ABB, Everett, Wash., (Over 1000 miles)

4BQ, 4EB, 4FT, 4GS, (4KF), (4KT), (4SAR), 5BE, 5HB, 5JW, 5KC, 5LA, 5NW, 5PX, 5QL, 5SM, (5XU), 5ZA, 5ZH, 5AB, 5ACH, 5ASV, 5ATU, 5BF, 5BKE, 5BRL, 5BWA, 5BXH, 5CFL, 5FT, 5IB, 5OW, 5UE, 5WE, 5AAW, 5AEQ, 5AJS, 5AJA, 5AKB, 5ALT, 5AMB, 5AMT, 5AOG, 5AON, 5APS, 5APW, 5ARG, 5ARZ, 5AUA, 5AVZ, 5AWM, 5AYS, 5BBF, 5BCB, 5BED, 5BJV, 5BSG, 5BXA, 5BZI, 5CP, 5CFI, 5CFY, 5CUI, 5DAX, 5DBL, 5DKY, 5DPL, 5DQE, 5DTE, 5DR, 5DSM, 5DZQ, 5ED, 5GK, 5IL, 5LZ, 5NX, 5PL, 5PN, 5UU, 5WD, 5XAC, (5YAJ), 5ZAC, 5ZAF.

7IY, Vashon, Wash.

Spark: 5BAH, 5CMI, 5ZY, 5ATV, 5AXA, 5AZA, 5BTX, 5CTW, 5DMJ, 5DNC, 5DZY, 5MC, 5FN, 5BSM.

C.W.: 5FF, 5FM, 5ZL, 4BF, 4BQ, 4OR, 4EB, 4GA, 4GB, 4GM, 4KK, 4LP, 4EK, 4ER, 4DI, 4DY, 4HE, 4KC, 4JL, 4LA, 4PX, 4QL, 4QW, 4RH, 4SL, 4SM, 4UK, 4UN, 4UO, 4VY, 4ZA, 4AFD, 4ASY, 4AFY, 4AQF, 4AQO, 4ACH, 4ATU, 4AXN, 4BBF, 4BDU, 4BFM, 4BCY, 4BFL, 4BWA, 4BFX, 4BRL, 4BNJ, 4CMI, 4CXN, 4HWA, 4IB, 4KG, 4OW, 4HRQ, 4BD, 4RT, 4SB, 4UK, 4UE, 4UC, 4Z, 4AGS, 4AYS, 4APW, 4ARR, 4ARZ, 4AWH, 4AUA, 4AON, 4AWM, 4AXV, 4AMB, 4AVZ, 4AWT, 4AGP, 4ABV, 4AOU, 4AMI, 4ANQ, 4APS, 4AJP, 4AJH, 4ACH, 4AOS, 4AAF, 4ATN, 4AHM, 4AIK, 4BBF, 4BTT, 4BFG, 4BQB, 4BCF, 4BED, 4BGH, 4BEY, 4BXA, 4BHD, 4BJV, 4BSG, 4BKG, 4BCB, 4BCM, 4CFI, 4CMR, 4DCK, 4DXN, 4DUL, 4DTM, 4DPL, 4DSM, 4DZQ, 4DKY, 4DR, 4DJQ, 4DHL, 4DTE, 4NU, 4II, 4RU, 4TM, 4TP, 4UU, 4XAC, 4ZAF, 4YAJ, 4ZAQ.

8BCY, Grand Rapids, Mich. (All Districts)

1FB, 1JT, 1RU, 1UH, 1AGH, 1ASF, 1BKQ, 1BUA, 1CGO, 2FP, 2FS, 2GK, 2HW, 2IW, 2NZ, 2TJ, 2UD, 2AFB, 2AUW, 2AWF, 2BEH, 2BNU, 2BUZ, 2CBW, 2BUC, 2ZL, 2BV, 2CA, 2HL, 2SL, 2TJ, 2AFB, 2AQR, 2AUU, 2BGT, 2BLU, 2BRW, 2BQ, 2BX, 2CG, 2DC, 2EB, 2EH, 2EL, 2FT, 2GK, 2ID, 2JK, 2KF, 2KU, 2DL, 2EK, 2ER, 2ES, 2FV, 2JL, 2JW, 2KC, 2MB, 2PX, 2SK, 2SM, 2AAM, 2XA, 2XW, 2ZA, 2CP, 2KA, 2PD, 2TF, 2TN, 2BEG, 2BOE, 2ZO, 2AB, 2AN, 2AX, 2BO, 2CF, 2CL, 2EA, 2FT, 2GA, 2HJ, 2IH, 2IW, 2JU, 2KG, 2NV, 2OI, 2OJ, 2OW, 2PM, 2PT, 2SB, 2SE, 2SL, 2SP, 2TO, 2UC, 2UE, 2UK, 2VQ, 2VY, 2WA, 2WI, 2WE, 2WR, 2WV, 2AAZ, 2ACH, 2ACO, 2AEG, 2AFD, 2AFK, 2AFV, 2AGO, 2AHA, 2AHE, 2AIM, 2AIT, 2AJP, 2AJX, 2ALF, 2ALT, 2AAM, 2AMQ, 2ANB, 2AON, 2APT, 2APW, 2AQF, 2AQU, 2ARO, 2ASV, 2ATU, 2AUA, 2AUY, 2AWP, 2AWT, 2AWZ, 2AXB, 2AXC, 2AXN, 2AZA, 2AZF, 2AZG, 2BAQ, 2BCF, 2BDB, 2BDO, 2BDU, 2BDV, 2BEF, 2BEP, 2BFM, 2BFX, 2BGL, 2BJC, 2BJX, 2BKE, 2BKL, 2BLT, 2BNJ, 2BNU, 2BNY, 2BOZ, 2BPL, 2BRC, 2BRF, 2BRL, 2BRM, 2BRQ, 2BUC, 2BUM, 2BUX, 2BVR, 2BVT, 2BWA, 2BXA, 2BXF, 2EXH, 2BXT, 2BYA, 2BYF, 2BZE, 2CAK, 2CAU, 2CAY, 2CAZ, 2CDL, 2CDZ, 2CEF, 2CEH, 2CFD, 2CGM, 2CGN, 2CGF, 2CGX, 2CIA, 2CJE, 2CJX, 2CJY, 2CKO, 2KE, 2ZN, 2ZZ, 2ZAF, 2AB, 2CR, 2DE, 2EI, 2FM, 2FZ, 2GL, 2IO, 2KI, 2KN, 2LG, 2LZ, 2NX, 2DX, 2PJ, 2PN, 2PS, 2RT, 2UC, 2UH, 2UN, 2US, 2WA, 2WC, 2WR, 2WT, 2AAF, 2ABV, 2ACS, 2AFN, 2AIP, 2AIU, 2AIX, 2AJH, 2AJP, 2ALW, 2AMI, 2AMQ, 2ANQ, 2AOG, 2AOL, 2AON, 2AOU, 2APS, 2APW, 2AQR, 2ARR, 2ARZ, 2ASD, 2ASZ, 2AUA, 2AUL, 2AWA, 2AWF, 2AWM, 2AXF, 2AYA, 2AYS, 2AZD, 2BAA, 2BAF, 2BBF, 2BCF, 2BCG, 2BCT, 2BDB, 2BDS, 2BEH, 2BEY, 2BGV, 2BHD, 2BHI, 2BJV, 2BKP, 2BKW, 2BLC, 2BMN, 2BNU, 2BQW, 2BRL, 2BSG, 2BSZ, 2DAH, 2DBM, 2DCA, 2DCR, 2DCT, 2DCU, 2DDK, 2DDY, 2DEK, 2DFB, 2DGO, 2DVT, 2DVW, 2DWX, 2DXN, 2DJQ, 2DKY, 2DQU, 2DSW, 2DZQ, 2XL, 2XAC.

8ZY, Defiance, Ohio (Every district)

Spark: (1AW), 1BOQ, 1CNI, 1GB, 2AJE, (2AD), (2ARY), 2BUE, 2WB, (FP), 2GK, 2QM, 2XAJ, (Can. 5BP), Can. 5GN, Can. 5BV, 5AHE, 5ACY, 5AWF, 5GL, (5GZ), 4BI, 4BX, 4CG, 4GM, 5BW, 5BE, 5EL, 5JP, 5JX, (5MO), 5XA, 5XB, 5XW, (5XAC), (5ZAW), (5ZL), 5ALF, 5AGP, 5ARS, 5ARD, 5AXB, 5AFG, 5AFT, 5ACT, (5AIT), (5AIZ), (5BVX), (5BDA), (5BEP), 5BRL, 5BQA, (5BRY), 5BXQ, 5BXC, 5BTJ, 5BIX, (5CTI), (5CMI), (5CDB), 5CDT, 5CYU, 5OCH, 5EE, (5EW), (5EO), 5CP, 5FT, 5IL, 5LH, (5TK), (5UC), 5WU, 5VE, (5VQ), 5ATV, 5AEP, 5ARG, 5ASK, 5AYS, 5ARR, 5AIR, 5AQE, 5AGO, 5AOJ, 5ANT, 5AUI, 5AQE, 5AIX, 5APW, 5AWK, (5AYW), (5AXU), (5AU), (5AZA), (5AFB), (5AZF), (5ABM), (5AMQ), (5AIP), (5AMN), (5ARG), (5BZZ), 5BBD, 5BTX, 5BNC, (5BMN), (5BSZ), (5BXC), (5BIQ), (5BWS), (5BXC), (5BZE), (5BHZ), (5CP), (5CS), 5CTW, 5DIX, 5DZQ, 5DPB, 5DCW, 5DP, 5DRW, 5DCW, 5DYX, 5DPW, 5MA, 5DKB, 5DZ, 5DXK, 5DWW, 5DTN, 5DCT, (5DSU), (5DJJ), (5DMJ), (5DKQ), (5DXT), (5DWM), (5FK), (5GC), 5GX, (5JX), (5K), 5LP, 5MC, 5MT, (5PN), 5PD, 5QR(5RR), (5TL), (5TV), 5UOU, 5VL, 5WX, 5YB, (5YM), (5ZN), (5ZU), 5ZQ, 5ZL, 5XT, (5WHB), (5DL), (5Z).

C.W.: 1AJP, 1BKQ, 1BQD, 1CVR, 2AJW, 2AUZ, 2AVE, 2AZY, 2BFS, 2BZN, 2BRO, 2BDO, 2CBW, (5FP), 2GK, 2KU, 2NZ, 2ZL, 2JANQ, 2AUU, 2BLF, 2BMN, 2BIJ, Can. 5BP, 5CBM, 5CZL, 5BO, 5FS, 5HD, 5OE, 5RE, 5RP, 5ZO, 5ZZ, 4BF, 4BNU, 4BQ, Can. 4BV, 4BX, 4DM, 4EB, 4EH, 4GH, 4KF, 4OI, 4BE, 4BX, 4CY, 4DL, 4EK, 4ES, 4EE, 4FV, 4JL, 4KC, 4QL, 4QS, 4SM, 4SK, 4SH, 4UD, 4XAD, 4XV, 4ZA, 4ZG, 4ZAV, 4ZEH, 4BSA, 4KA, 4EN, 4XJ, 4XAD, 4ZF, 4ZQ, 7AD, (5AFY and phone) 5AFB, 5AIO, 5ANH, 5AIX, 5APT, 5AQF, 5AWP, 5one, 5ATU, 5AA, 5ADT, 5ASV, 5AKF, 5AXB, 5AWZ, 5AIM, 5AWT, (5BYC), 5BJL, 5BJC, 5BJX, 5BKY, 5BCK, 5BCE, 5BKE, 5BDO, 5BQZ, 5BQF, 5BUS, 5BXC, 5BWA, 5SL, 5BOQ, 5BXH, 5BVR, 5BO, 5BRH, 5BFL, 5BFM, 5BUX, 5BXH, 5BRW, (5CJH), 5CUL, 5CJX, 5CAJ, 5CAC, 5CZC, 5CAY, 5CWB, 5COO, 5CKO, 5CYT, 5CQM, 5CUM, 5CBC, 5CDZ, 5CTU, 5CMH, (5CBR), 5CJO, 5CN, 5CV, 5CNI, 5CMI, 5DW, 5DZ, 5ER, (5FT), 5FL, 5IJ, 5JQ, 5JP, 5UK, 5UP, 5UE, 5VZ, 5WR, (5XJ), 5YD, 5Z, 5ZE, 5ZH, 5ZAF, 5ZAG, 5APW, 5ARW, 5ANG, 5APS, 5AON, 5AEQ, 5AFN, 5AAF, 5AOG, 5AYS, 5ABV, 5AQ, 5ARR, 5AOG, 5one, 5AJH, 5AW, 5ANF, 5AVA, 5ACI, 5AXC, 5AKB, 5AWF, (5AII), 5AVV, 5AWM, 5ACS, 5BSO, 5BOT, 5BED, 5BJV, 5BJY, 5BHD, 5BOS, 5BVP, 5BZI, 5BZZ, 5BYZ, 5BCB, 5BHC, 5BTT, 5CP, (5CBA), 5CVW, 5CNU, 5GJA, 5DSD, 5DUG, 5DAX, 5DKY, 5DKB, 5DGN, 5DGR, 5DPL, 5DZW, 5DR, 5DBL, 5DCR, 5DZY, 5DJQ, 5DCF, 5DJO, 5DCF, 5KY, 5FM, (5FK), 5GE, 5GL, 5HK, (5II), 5IO, (5KP), 5NX, (5PS), 5UC, 5UU, 5WA, 5YX, 5YAJ and 5one, 5ZAA, 5ZAK, 5ZL, (5ZN).

9ZAF, Denver, Colo.

Spark: 5EL, 5EN, 5JP, 5QR, 5XA, 5EV, 5KE, 6VA, (6AJH), 7ED, (7EU), 8HDA, 8EK, 9II, 9NX, (9RR), 9ZN, 9AJD, 9AMK, 9AUK, 9AYW, 9BDH, 9BKN, 9BSZ, 9BXM, 9BZC, 9BXX, 9CTW, 9CWT, 9DQK, 9DXC, 9YAK.

C.W.: 2FP, 4BF, 5BE, (5DW), (5DI), 5DY, 5EK, 5IR, (5JL), 5JB, 5KB, 5KC, (5LB), 5NE, 5NY, 5PS, 5PX, (5QI), 5RJ, 5SF, (5SM), 5TU, 5UK, 5UN, 5VA, 5VO, 5XB, 5XV, 5XY, 5YQ, 5ZA, 5ZQ, 5ABA, 5ABY, 5ZAP, 5ZAV, 5ZAW, 5BPF, (5CP), 6CU, (6EA), (6EB), 6EN, (6FH), (6FT), 6GE, (6JD), 6KA, 6NX, 6RR, (6XJ), 6XP, 6ZA, (6ZB), 6ZF, (6ZG), (6ZS), (6ZX), 6ABX, (6AGP), 6AJH, (6ALU), 6AMD, 6AOA, (6APW), (6AQW), 6ARB, 6ASJ, 6ATQ, 6AWB, (6AWT), 6BBC, 6BCR, 6BEG, (6BES), 6BFG, 6BHQ, (6BJQ), (6BJY), (6BMD), (6BOA), 6BFL, 6BPQ, (6BPZ), (6BQC), 6BQD, 6BQK, 6BQZ, 6BRK, (6BSA), 6BSW, 6BXT, (6XAD), 7HS, (7LU), 7QD, (7YA), (7ZB), 7ZG, 7AEA, (7AFW), 7AB, 7IB, 7WR, 7X, 7ANE, 8AQS, 8AWV, 8AXE, (8AZD), 8BCY, 8B, 8BUI, 8CKX, 8CJH, 8DZ, 8DC, 8CK, 8CP, (8DR), 8EW, (8FK), 8FM, 8FV, 8HT, 8HW, 9II, 9KP, 9MP, 9OX,

9PA, 913, 9QF, (9UU), 9XL, 9YW, 9ZG, 9ZL, 9ZZ.
 9AAP, 9AUN, (9ABV), 9AEP, 9AFN, 9AFW,
 9AGR, 9AJP, 9AJX, 9AMI, 9AMS, 9AMU, 9ANF,
 9ANQ, 9ANS, 9AOG, 9AOL, 9AON, 9APS, (9APW),
 (9AQM), 9AQZ, 9ARR, 9ARZ, 9AUA, 9AUS, 9AVS,
 9AWM, 9AYS, 9BAF, 9BAV, 9BBF, 9BBS, (9BCF),
 9BOY, 9BDI, 9BDS, 9BED, 9BEP, 9BFG, 9BGH,
 9BHD, 9BIW, 9BJA, 9BJM, 9BJV, 9BKB, 9BKP,
 9BKL, 9BLC, 9BMD, 9BMN, 9BOA, 9BPF, 9BSG,
 9BTT, 9BVP, 9BXM, 9BXT, 9BYA, 9BZI, 9CAD,
 9OAO, 9CCS, 9CFI, 9CJJ, 9CKM, 9CNS, 9COI, 9CPB,
 9CTE, 9CTW, 9CUG, 9CWI, 9DCF, 9DCU, 9DET,
 (9DGE), 9DGM, 9DJY, 9DKL, 9DKQ, 9DKY, 9DNT,
 9DOF, (9DPL), 9DQE, 9DQM, 9DQU, 9DSM, 9DUG,
 9DXD, 9DXN, 9DYQ, 9DYZ, 9DZI, 9DZQ, 9DZU,
 (9YAJ), 9ZAA, Canadian (4BV), 9AC, AD7, Phone:
 5QT, 5ZG, 6AK, (6XJ), (7YA), 9YAJ.

9YAJ, Dept. of Physics, St. Olaf College
 Northfield, Minn.

Spark: (5JF), 5MO, 5TP, 5TU, (5XAC), 5ZAW,
 8AFG, 8BDA, 8BXC, 8SP, (9AMK), 9AOJ, 9AQE,
 9ARQ, 9ARX, 9ATV, 9AU, 9AXU, 9AYW, 9AZA,
 9AZF, (9BMN), 9BSZ, 9BTX, 9BWS, (9BXC),
 9DGF, 9DNC, 9DOT, 9JX, 9LF, 9MC, (9RR), 9XT,
 (9YB), 9ZC, (9ZN).

C.W.: (1AJF), 1ARY, 1YK, 1FB, (2BNZ), 2FP,
 (2GK), 2AWF, (3AQR), 3BLF, 3BP Can., 3EB,
 (3GK) Can., (3KO), 3BV Can., 3BNU, (3MK),
 3OT, (3VW), 4BF, 4BQ, (4BV) Can., 4CR, 4GB
 Can., 4KF, 5BE, (5DI), 5DW, 5DO, 5DY, 5FK,
 (5EL), 5JB, (5JL), 5JW, 5KC, 5NV, 5PX, (5QI),
 5QS, (6RH), 5RJ, 5SF, 5SG, 5SK, 5SN, 5UN,
 (5UO), 5VI, 5XA, 5XU, 5XY, 5YAC, 5ZA,
 5ZAV, 5ZT, 5ZZ fone, 6BOE, 6ASJ, 6BSA, 6CP,
 6BSA, 6CP, 6JD, 6KA, (6GR), (7LU), (8AB),
 8ABQ, 8ACH, (8ADT), 8AFD, 8AFY, 8AIN, 8AIO,
 8AKP, 8ALF, 8ALT, (8ANB), 8APW, 8ATU,
 8AWZ, 8AXB, (8AXC), 8AYS, (8AZD), 8AZO,
 8BOY, 8BEB, (8BEF), (8BFM), 8BFX, 8BFZ,
 8BHO, 8BJC, 8BJX, (8BKE), 8BKI, 8BMM, 8BNJ,
 8BO, 8BRL, (8BTL), (8BUC), (8BUX), 8BVR,
 (8BWA), 8BWK, 8BXC, 8BXH, 8BZV, 8CAU, 8CF,
 8CFP, 8CGX, 8CL, 8CJH, (8CKO), 8CUR, 8CAN,
 (8CMM), 8DZY, 8FT, 8IB, (8IJ), 8OW, 8SB, 8SL,
 8UK, 8VY, 8WI, (8WR), 8ZAF, (8ZE), 8ZZ, 9AAP,
 9ABV, 9AC Can., 9ACS, (9AD7), (9AEP), 9AFN,
 9AGG, 9AHN, 9AIP, 9AIV, 9AII, 9AJH, 9AJP,
 9AL Can., 9ALW, 9AMB, 9ANQ, 9AMQ, 9AOG,
 9AON, 9AOU, (9APS), (9APW), 9AQR, 9ARR,
 9ARZ, 9ASN, 9ATU, (9AUA), 9AUS, 9AWF,
 (9AWM), (9AYS), 9BBF, 9BCB, 9BED, 9BEH,
 9BGH, 9BHD, 9BHN, (9BIW), (9BJV), 9BKJ,
 (9BKP), 9BKW, 9BSG, (9BTT), 9BVP, 9BXA,
 9BXT, 9BXY, 9BZE, (9BZI), 9CFI, (9CGD),
 (9CQF), (9CHN), (9CJA), (9CMJ), 9CNH, 9CP,
 9CPB, 9CPC, 9CPH, 9CT, 9CTR, (9CTW), 9CVW,
 (9CTW), 9CVW, (9CJT), 9DBL, 9DCF, 9DCG,
 9DCR, (9DCU), 9DFX, (9DGE), 9DHB, 9DHz,
 9DJZ, (9DKB), (9DKY), 9DMJ, 9DOL, (9DPL),
 9DPR, 9DQE, 9DQO, 9DQU, (9DR), (9DSM), 9DSO,
 (9DSW), (9DUG), 9DUN, (9DVW), (9DXN),
 9DXL, 9DZQ, 9DZW, 9DZY, 9EI, (9EW), 9FK,
 9FM, (9IF), (9II), 9IO, 9IY, 9KN, (9KP), 9MY,
 9LN, 9NX, 9OF, 9OX, 9PA, 9PS, (9PI), (9QE), 9QF,
 9QR, (9UC), 9UH, 9UU, 9VE, 9VZ, 9XL fone,
 (9WB), 9YAE, 9ZA, 9ZAA, (9ZAF), (9ZL), 9ZN,
 9ZO, (9ZU).

9AHC, Ellendale, N. Dak. (1 tube)

C.W.: 1BDI, 1XU, 2BP, 2BRC, 2NZ, 3ALN, 3BNU,
 3LR, 3OT, 3QV, 3XAI, 3ZZ, 4BF, 4BQ, 4BX, 4FT,
 4KF, 5AAR, 5ACF, 5AE, 5AG, 5BE, 5BM, 5CY,
 5DI, 5DW, 5EG, 5EK, 5EL, 5FV, 5IR, 5IX, 5JB,
 5JL, 5JW, 5KC, 5LB, 5ME, 5ML, 5NB, 5NV, 5PF,
 5PO, 5PX, 5QI, 5QS, 5RH, 5RJ, 5SF, 5SK, 5SM,
 5UB, 5UK, 5UN, 5UO, 5VA, 5XV, 5ZA, 5ZAV, 5ZG,
 5ZH, 5ZZ, 6AAG, 6ABX, 6ALL, 6APW, 6ATQ,
 6AVD, 6AW, 6AWT, 6BF, 6BJY, 6BKO, 6BOE,
 6BUL, 6BSA, 6BUM, 6BVQ, 6CP, 6CU, 6EB, 6EN,
 6GX, 6KA, 6NX, 6RD, 6RR, 6XAD, 6XJ, 7AFW,
 7HS, 7LU, 7MF, 7SC, 7TH, 8AB, 8ACH, 8ACO,
 8AFD, 8AFY, 8AIG, 8AIO, 8AKP, 8ALF, 8AMM,
 8APT, 8APY, 8AQF, 8AQO, 8ARD, 8ASV, 8AWT,
 8AWZ, 8AXB, 8AXN, 8AZD, 8BAK, 8BCY, 8BDB,
 8BPM, 8BFX, 8BGL, 8BGO, 8BJC, 8BJV, 8BKE,
 8BMK, 8BNJ, 8BQF, 8BRL, 8BUC, 8BUX, 8BVT,

8BWA, 8BXC, 8BXH, 8BXT, 8BZY, 8CAK, 8CAU,
 8CAZ, 8CBC, 8CBX, 8CDZ, 8CF, 8CGP, 8CIA, 8CJH,
 8CLD, 8CMM, 8CMY, 8CPX, 8CUR, 8CUS, 8DAK,
 8DCY, 8FT, 8IC, 8IJ, 8JU, 8KG, 8OE, 8SB, 8SP,
 8UE, 8UK, 8VY, 8XE, 8XJ, 8YD, 8ZAF, 8ZE, 8ZZ;
 nearly 200 notes including following over 500 miles:
 9AAP, 9ABV, 9AFN, 9AIU, 9AII, 9AJH, 9AKB,
 9ALW, 9AMB, 9AMQ, 9ANQ, 9AOG, 9AON, 9APS,
 9AQM, 9AQR, 9ARK, 9ARR, 9ASD, 9ASU, 9AUS,
 9AVN, 9AWF, 9AYB, 9AYH, 9BAZ, 9BDS, 9BED,
 9BEH, 9BHD, 9BHN, 9BIW, 9BIZ, 9BKM, 9BLO,
 9BQW, 9BUN, 9BVP, 9BXA, 9BYA, 9BYF, 9BZZ,
 9CAC, 9CAO, 9CCS, 9CEB, 9CFI, 9CFY, 9CGD,
 9CGN, 9CJA, 9CKM, 9CLN, 9CNS, 9COI, 9CP, 9CPO,
 9CST, 9CTW, 9CUG, 9CUO, 9CVI, 9CVO, 9DCR,
 9DDY, 9DFB, 9DGQ, 9DHB, 9DJB, 9DJQ, 9DNJ,
 9DPI, 9DPL, 9DRR, 9DSB, 9DTE, 9DTJ, 9DTM,
 9DUG, 9DUN, 9DXN, 9DZB, 9DZU, 9DZY, 9EI,
 9EJ, 9FM, 9FV, 9GL, 9II, 9IO, 9KP, 9LQ, 9LZ,
 9NU, 9NX, 9OX, 9PA, 9PF, 9PS, 9PW, 9QR, 9UG,
 9UU, 9VK, 9WA, 9XAC, 9XL, 9XM, 9ZAF, 9ZE,
 9ZNI!!!!, CYL, WUBA, Canadian: 3BP, 3KO
 QRA7, 4BV, 4GB QRA7, 9AC QRA7, 9AL.

Fone: 5ZZ, 9ASF, 9BEY, 9BQW, 9CUC, 9PI, 9YA.
 Spark: 5AQ, 5EI, 5MO, 5NS, 5QS, 5TC, 5TU, 5UD,
 5UE, 5XAC, 5ZAW, 5ZW, 7ZG, 7ZU, 8ARD, 8BDA,
 8EB, 8PU, 8UC, 8ZY; notes over 500 miles: 9ACL,
 9AFK, 9AHZ, 9AIP, 9AIR, 9AMK, 9AMQ, 9AOJ,
 9AQE, 9ARG, 9ARX, 9AU, 9AZE, 9BMN, 9BWS,
 9CA, 9CP, 9CTW, 9DCW, 9DEL, 9DHz, 9DMJ,
 9DSB, 9DUG, 9DZY, 9GC, 9JX, 9KA, 9LF, 9MC,
 9OX, 9RR, 9TV, 9YB, 9YM, 9ZN, 9ZV. Every
 district heard in 40 minutes.

9ZN's "FJ", 5723 Winthrop Ave., Chicago, Ill.

Spark: 1AW, 1GM, 1CNI, 2BY, 2FP, 2OM, 2AER,
 2BJO, 2DCY, 3AWF, 3UD, 4BL, 4FD, 4GN, 4HX,
 4KC, 5BW, 5FJ, 5JF, 5MO, 5TU, 5XA, 5XAC, 7ZU,
 8AZZ, 8ARZ, 8AS, 8ARD, 8AFG, 8AFK, 8AWU, 8ATO,
 8AL, 8ACF, 8AZF, 8AYI, 8RXC, 8BDA, 8BEF,
 8BIB, 8BRL, 8BYO, 8CYU, 8CSD, 8CP, 8EB, 8EW,
 8FT, 8KJ, 8NZ, 8UC, 8ZY, 9APR, 9AZF, 9AMT,
 9ARX, 9AIR, 9AZE, 9AIP, 9AGG, 9ARG, 9AYW,
 9AZA, 9AUA, 9ATV, 9APW, 9AXU, 9AIB, 8BMN,
 9BXT, 9BKK, 9BDF, 9BSZ, 9BXC, 9BXT, 9DWM,
 9DXT, 9DTN, 9DZY, 9DCW, 9DUG, 9DMJ, 9DJB,
 9FK, 9LF, 9MC, 9PD, 9RR, 9TL, 9UH, 9VZ, 9YB,
 9YM, 9ZV.

C.W. on loop: 1AJF, 1AHM, 1AM, 1AWB, 1ASF,
 1ABD, 1AZL, 1BDI, 1BGF, 1BKQ, 1BWJ, 1CCZ,
 1FB, 1ON, 1XP, 2AMZ, 2AZZ, 2BRC, 2BMR, 2BRB,
 2BNZ, 2BSC, 2BTW, 2EL, 2FP, 2GK, 2NZ, 2RB,
 2VA, 3AQR, 3AEV, 3APR, 3AIS, 3ALN, 3BGT,
 3BVL, 3BMG, 3BUC, 3BIJ, 3BNU, 3BVA, 3BLU,
 3CA, 3FS, 3LR, 3MK, 3OT, 3SK, 3VW, 3XAI, 3ZZ,
 4AU, 4BC, 4BY, 4BX, 4CA, 4DP, 4EL, 4FE, 4FT,
 4GH, 4GK, 4GX, 4JX, 4JY, 4NV, 5AUL, 5BE, 5CY,
 5DI, 5EK, 5ER, 5JL, 5QS, 5SM, 5SF, 5UK, 5UO,
 5ZA, 6ABX, 6ASJ, 6AWT, 6CP, 6CU, 6JD, 6KA,
 6XAD, 7LU, 7ZO, 8ACS, 8AXB, 8ANB, 8AXN,
 8AFD, 8AN, 8AWM, 8ATU, 8ASM, 8APN, 8AQO,
 8APT, 8AZR, 8APW, 8AQF, 8AGO, 8ATV, 8AIO,
 8ABV, 8AOL, 8ADT, 8ALF, 8AER, 8AHR, 8AWP,
 8AXC, 8ARD, 8ARZ, 8AMM, 8AZD, 8AB, (French
 ? hi), 8BFM, 8BWA, 8BXH, 8BKN, 8BRQ, 8BEF,
 8BKI, 8BTL, 8CGM, 8BDU, 8BDB, 8BKE, 8BJX,
 8BUC, 8BHO, 8BTR, 8BSY, 8BAH, 8BFQ, 8BWK,
 8BDE, 8BOQ, 8BRQ, 8BXT, 8BMM, 8BVR, 8BWK,
 8CJH, 8CKO, 8CMY, 8CEI, 8CUR, 8CBG, 8CJY,
 8CTP, 8CAK, 8CRZ, 8CKM, 8CFP, 8CAU, 8CF,
 8CAK, 8CGX, 8CVC, 8CLD, 8CTK, 8CON, 8CDZ,
 8DAK, 8FS, 8FT, 8HJ, 8IB, 8KG, 8SB, 8UE, 8UK,
 8VY, 8WR, 8XE, 8ZAF, 8ZAE, 8ZE, 8ZZ, 9ABV,
 9AQM, 9AYS, 9AVZ, 9AAP, 9AJP, 9ATV, 9APS,
 9APW, 9AUS, 9AAZ, 9AON, 9AFT, 9AQE, 9ARR,
 9AMO, 9AOG, 9AAU, 9ASD, 9AWF, 9MI, 9AIB,
 9ASJ, 9AWM, 9AFN, 9ACS, 9ARG, 8BGH, 9BSG,
 9BAF, 9BFS, 9BCF, 9CYA, 9BEH, 9BZI, 9BTT,
 9BWK, 9BBE, 9BJV, 9BBF, 9BED, 9BXT, 9BXY,
 9BWP, 9BHD, 9CAH, 9CEK, 9CGN, 9CFI, 9CPM,
 9CFW, 9CEB, 9CJT, 9CXW, 9CJA, 9DR, 9DSB,
 9DKY, 9DPL, 9DJO, 9DEK, 9DCR, 9DTJ, 9DZQ,
 9DNT, 9DUG, 9DQU, 9DVW, 9DZW, 9DBK, 9DTM,
 9DJQ, 9DSM, 9DUN, 9DGE, 9EI, 9EJ, 9EW, 9FK,
 9HK, 9IO, 9II, 9LQ, 9NU, 9OF, 9OX, 9PF, 9PS,
 9RR, 9UC, 9UH, 9WA, 9XAC, 9XL, 9YAJ, 9ZAF,
 9ZL, 9ZV, Canadians 4BV, 3CO, 8KO.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility
for statements made herein by correspondents.



"Who Will Save the A.R.R.L.?"

Atlanta, Ga.

Editor, QST:

I have just read with disgust the article in "Radio News" about us amateurs. The insinuations which this bird makes are an insult to the whole A.R.R.L. and if you fellows at Headquarters don't start something, such bunk as that will soak in some of these fellows' heads and then there will be a scrap. I was "all het up" when I read the parts about you and the whole gang there at Hartford, and I want to make a motion right now that any A.R.R.L. member that tries in this contest ought to be tarred and feathered and hung suspended from the top of the Washington Monument.

Let 'em have it, because the whole gang here is with you.

Best 73's

H. L. Reid, 4KU.

What Some Think

Ithaca, N. Y.

Editor, QST:

I've had a great load on my chest for quite some time and when a radio man is in such a condition, there is only one thing to do. Get it off!

It grieves me greatly, as a before-the-war ham, to see the present crop of crystal, tuning-coil, broadcast listeners refer to themselves as "amateurs." Why, man alive, they aren't any more amateurs than a Siberian weasel. They aren't interested in radio. They simply use radio as a means to get their pretty (?) music. Do people who have victrolas refer to themselves as "Musical Reproduction Engineers"?

The editor of a radio magazine, which used to be for amateurs, seems to differ with me. He calls the radiotele crowd "amateurs." It was the old amateur boys who built and supported his magazine when it was young, but now that he's got a larger audience for his enlightening (?) editorials, he tried to *straddle* the issue, like a fourth-rate politician, and call all people who use radio, for any reason, amateurs. He's after the almighty dollar, just like the rest of his race. (T.O.M., send for the K.K.K.)

These broadcast fish will never be amateurs. They'll tire of over-modulated mu-

sic. Some Wednesday night this winter, tune in BG5, a Signal Corps station in Ithaca. Shades of a 1902 phonograph with a cracked record and worn needle! Music!!!!

I certainly have to laugh over some of these ambitious money-making schemes, which are results of the sudden radiolite-broadcast catastrophe. Some bird in town here has started a radio course. I swear that 6 months ago, he didn't know a lightning-switch from a grid-leak. "We've got the dope," he advertises. He's bought a load of junk, mostly loud-speakers, and has "gone in deep" as his agricultural son informed me. He gives free evening concerts, FREE! His aerial is PARALLEL to the street car tracks, 10 yards away, and when a car goes by, well, hold tight, Mildred, it's only an "amateur's" radio set.

Just as marriage is a cause of divorce, poor concerts will ruin broadcasting.

Yours for light wine and dark beer,

John Paul.

[Editor's Note: A day hardly goes by without a letter such as the above being received at our office. We all admit that lots of things we have seen and heard lately give us a supreme pain in the ground connection. The chief offenders are those who have heard of the big money in radio and who, with little or no experience, pose as experts or try to gain publicity thru astounding statements. If a broadcast listener is building a set and needs help and advice we should by all means do what we can for him as he is almost an amateur (except for a wrong start) and the amateur co-operative spirit should be shown him. But these know-it-alls,—!]

Righto!

Worcester, Mass.

Editor, QST:

Recently I have noticed among some amateurs the "razzy" attitude towards the r.f.l. (radiofone listener). I am not one of them, in fact I got the bug or disease back in 1912 and have had it ever since, even with Uncle Sam and later as operator at 1XZ. What I would like to bring out is that if we continue our present attitude it will tend to draw these r.f.l. men away from affiliation with the A.R.R.L., some of whom in time would probably be bona fide

hams, "even as you and I." They will get the idea that they belong to a different species of bug, and co-operation with them will be made much harder, if not impossible.

Wouldn't it be better all around if we tolerate them and show them how much more fun it is to learn the code and to actually communicate with hams hundreds of miles away, than to just sit and listen to a dozen peanut roasters within the radius of a few hundred miles?

It seems to me that we ought not sit back and fold our arms with the "thank God we are not as they" attitude. Let us get out and "rush" worthy r.f.l.'s for our A.R.R.L. It is a good chance to win a prize for subscriptions to QST too.

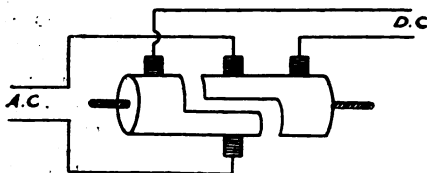
With best wishes,
A. W. Parkes

A Sync Rectifier

S. S. Redondo,
San Diego, Cal.

Editor, QST:

Here's a sketch of a high voltage synchronous rectifier, which, having gone into disuse owing to its inability to handle larger currents, should find favor among those operating C.W. sets.



The principle of operation is exactly the same as in GZZ's layout, the only difference being in the mechanical design.

Hoping this gadget may be of some use, I remain,

Cordially,
Ben. B. Skeets.

A Sample

Milwaukee, Wis.

Editor, QST:

Last winter and spring I was a confirmed broadcast hound, but since then I have mastered the code somewhat at the age of twenty-five, operate the above station, and believe me, get ten times the enjoyment after having joined the ranks of the hams. I can thank broadcasting that it indirectly got me with the real bunch.

One of my friends approached me about subscribing to QST because he was out for a prize. I am already a subscriber, but like it so well, that I subscribed for another year in advance and also ordered a subscription for my young brother.

Yours in the name of amateur radio,
E. T. Howell, 9CVI.

Awrf!

Dire Mr. Editaire:

Igo dosa beega M.I.T. schoola Cambridge Mass. U.S.A. anda somteengs heesa heppen dere dosa day verrai funnay. My eenglissha teechaire he say, "Geev me da quartaire anda I buya da papaire for you." I geeva heem da quartaire anda he geev me wan beeg radio papaire an say "Looka heem ovarire anda discouse somteengs about heem inside." For longa tim I lika buya dosa papaire but I no lika pay so mooch money for justa covaire. I belonga me da gooda papaire—she's a calla da QST—I lika heem dam fin. Well, bimeby I looka heem ovaire dosa beega papaire witha dosa prittay covaire, anda I finda he's a full a watumacalla da bull. Onlay wan theeng I finda I lika da read. He's calla da "Brickbat Glacé" on da page 453. Da nexta lasta pairagrapha especailment. He's my cements exactlay—I bin theenka dosa sems theeng myselph longa tim. So I writa beeg discouse bout dosa "Brickbat Glacé" anda mi teechaire he's a say, "Atsa gooda wun." He's a maka mi feela gooda wen I theenka I belonga dosa QST anda dosa A.R.R.L. I nevaire, nevaire reada again dosa beega bull papaire.

I see sumteengs wun tim in mi QST she's a say, "Taka you pen in hand," so I hev write lettaire to you.

Hopa you family es good, mooch oblidge.
Tony Spaghetti.

More on Break-In

Toronto, Ont.

Editor, QST:

Perhaps you will permit one of your newest members to say a word or two anent the subject of "Break-In" or Duplexing systems of reception. I was much interested and impressed by an article in the October number of QST by "BeeP" on the above subject. The good old "wave trap" offers one of the best solutions to the trouble of the receiving antenna absorbing too much energy which should be producing the sigs at the receiving end of the circuit.

Some time ago the writer succeeded in obtaining with the minimum of experimental work, a quite good duplex for phone work by means of the simple arrangement of connecting the receiver to the aerial and ground terminals of the transmitter thru a wave trap. The transmitter employed was a 5-watter working on 261 metres. The antenna current was of the order of 0.75 amperes. Reception of short waves up to 251 metres was excellent, there being but a small weakening of the received signals from another phone set of similar power working on that wave in the city here.

For the "wave-trap," use was made of a wavemeter with a coil of 25 turns of No. 16 gauge D.C.C. wire on a form 3½-inches in diameter, and a variable condenser of 0.001 mfd. capacity maximum of a good

standard make. The excellence of the condenser is a matter of prime importance, as is also the resistance of the coil, which should be as low as possible. It is recommended that the coil be made of some such material as copper gas-line piping.

The tuning of the circuit is most easily done by means of the T.C. milliammeter placed in series with the receiver primary and tuning the trap so that minimum current is obtained. The transmitter should, of course, be operated at reduced power while this is being done. Another method which is rougher consists in tuning the circuit so that the antenna ammeter of the transmitter shows no falling off when the wave trap is connected.

One further note,—the tuning of the primary of the receiver is rather "funny" when the wave trap is in the circuit; but a reasonable amount of persistence will show how to deal with this.

Yours sincerely,

R. A. H. Galbraith,
Canadian 9AJ.

Saved at Last!

Oct. 16, 1922

Editor. QST:

We have noticed
That a certain magazine
Has published an article
With a grand big prize
Of 500 berries
For some poor boob
Who will sit down and write
A Little Story of 1000 words
With a heading entitled
"Who will save the amateur."
We can't but wonder why
This radio editor
Has offered so much
For this kind of a story
When it has always been
His claim to be
The only friend

That the amateur had
And the only one who
Took his part whenever
He was being imposed upon.
And we'd like to say
That all amateurs know
There is only one way
To save the amateur
And that is this:
To do away with single circuits
And magazines that have
An editor like him.
I thank you.

Ate Gee Oh.

(Apologies to K.C.B.)



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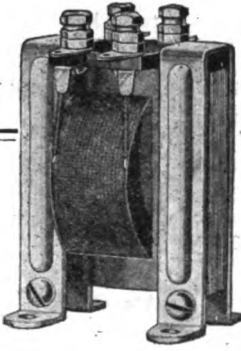
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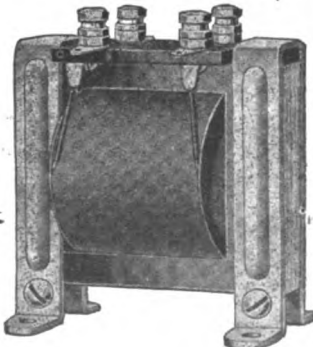
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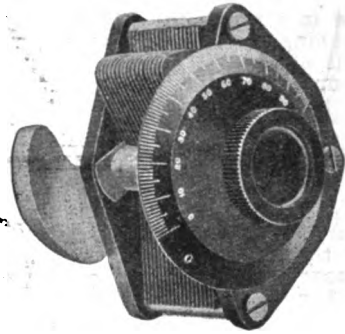
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No. 4	Panel .0005 mf. with dial	4.25
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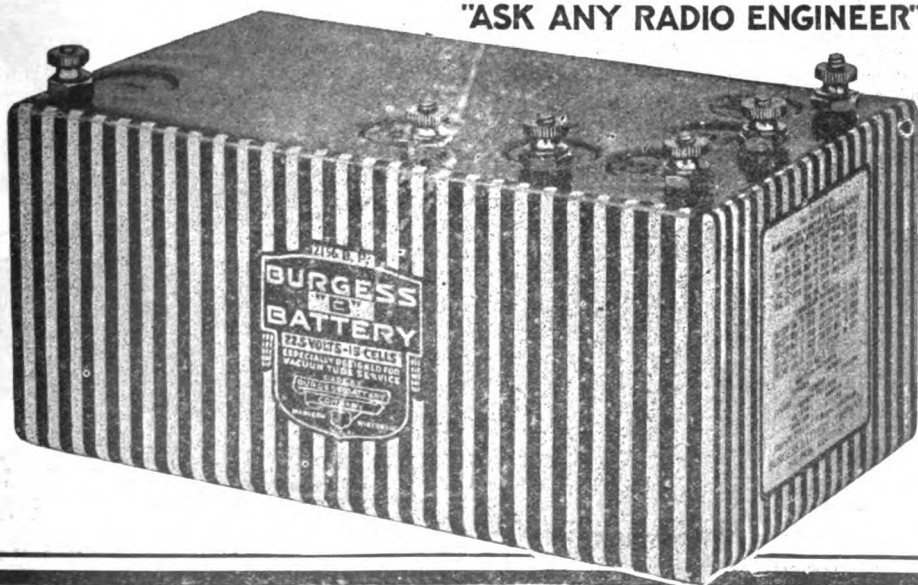
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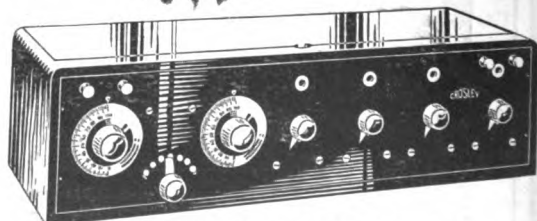
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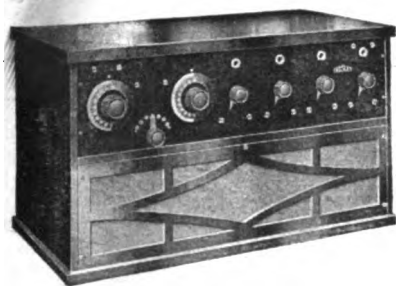
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CROSLY MODEL XXV

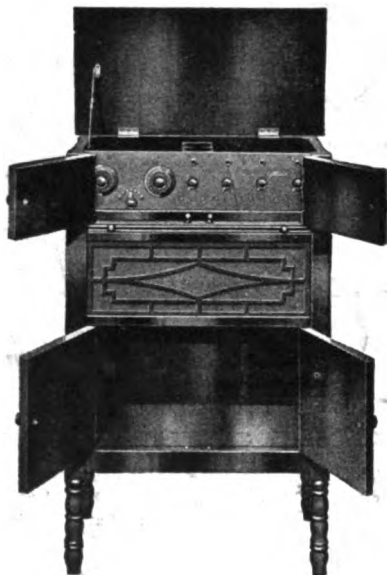
This beautiful mahogany cabinet is equipped with four tube panel incorporating the same units as the Model X, but the panel is of a different shape, as will be noticed from the illustration. This cabinet is arranged to take the Model R-3 Magnavox that can be quickly installed and hooked up to the set, but the Magnavox space for "A" Battery, "B" Battery and battery charger if desired. A throw-over switch is provided to change from head phones to loud speaker. It is guaranteed to bring in broadcasting stations up to one thousand miles or more, loud enough to be heard all over the room. This beautiful instrument, without tubes, batteries or phones, sells for \$150.00.

Three Beautiful Cabinet Models



CROSLY MODEL XV

Incorporates the same receiving apparatus as the other instruments on this page. Has special sound resonating chamber but without compartment for batteries. Can be set upon a table or stand. Will fill your room with music or other broadcasting. Mahogany finished. Price without tubes, batteries or phones \$70.00.



CROSLY MODEL XX

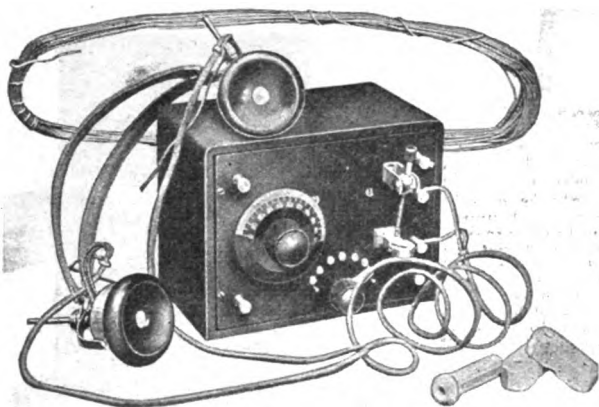
The same as CROSLY RECEIVER MODEL X in an upright cabinet with special sound resonating chamber. A hinged lid, when raised allows the operator access to every part of the receiving apparatus. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Has the same volume and range as the MODEL X. Mahogany finished. Price without tubes, batteries or phones \$100.00.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog.

CROSLY MANUFACTURING CO.
DEPT. QST 3
CINCINNATI, OHIO

~~CROSLEY~~ Better---Cost Less RADIO

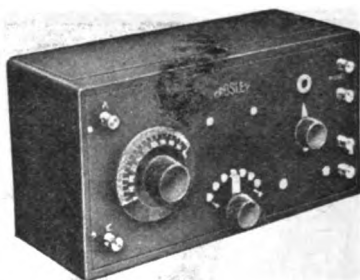


CROSLEY CRYSTAL RECEIVER MODEL I

This outfit complete as shown, is not only very efficient of its type, but is beautiful in finish and appearance, and complete. Later, if desired, additional units can be added, including audion detector, radio frequency amplifier and two stage audio frequency amplifier. Manufactured under the Pickard patents. Price of the set illustrated above complete with instructions is \$25.00.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

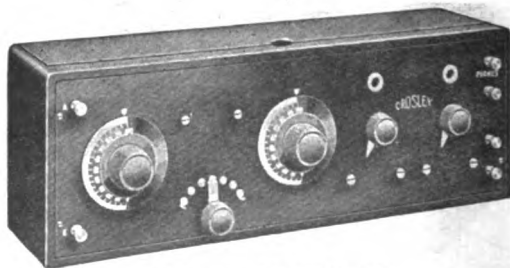
Send for Catalog.



HARKO SENIOR MODEL V

Greatly refined and improved gives better results than ever before. We guarantee it to bring in even distant broadcasting stations and believe it to be the most efficient one-tube receiving set on the market. With this unit, Denver has heard Schenectady, N. Y., and many other wonderful distance records have been made. Price without tubes is only \$20.00.

Three Smaller Models Of the Usual Quality Crosley



CROSLEY MODEL VI

A two-tube set similar to the MODEL X shown on the first page. This unit has approximately six times the range and volume of the Harko Senior. It consists of one stage of Radio Frequency Amplification and Audion Detector. It eliminates static to a large extent and distant stations are brought in clear and sharply. Price without tubes, batteries or phones \$30.00.

CROSLEY MANUFACTURING CO.
DEPT. QST 3 CINCINNATI, OHIO

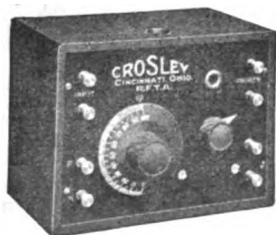
Tuned Radio Frequency Amplification

CROSLEY
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RADIO

The Feature of Our Larger Units

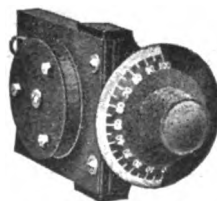
Can be added to practically any set.—

Everyone now recognizes that the Engineering Department of the Crosley Manufacturing Company has solved the solution of the radio frequency problem. Tuned Radio Frequency Amplification, as developed by the Crosley Manufacturing, is unquestionably a wonderful success. It increases the range for receiving outfits to a remarkable degree, and eliminates static and other forms of interference, and yet is simple to tune.



RADIO FREQUENCY TUNED AMPLIFIER—R. F. T. A.

This unit was originally designed to be used in connection with the CROSLEY HARKO SENIOR MODEL V. Hook ups have now been worked out for its efficient use with Westinghouse, Grebe, Clapp-Eastham and many other popular receiving sets, adding one stage of Tuned Radio Frequency Amplification to any of them. Complete instructions showing these hook ups are furnished with each Radio Frequency Tuned Amplifier, or will be sent upon request to anyone free of charge. Price of the Crosley R. F. T. A., as illustrated above in beautiful mahogany finished cabinet is \$15.00.



RADIO FREQUENCY AMPLIFYING TUNER—R. F. A. T.

The solution of Radio Frequency Amplification lies in the Crosley Radio Frequency Amplifier Tuner shown above. It takes the place, in a surprisingly successful manner, of a Radio Frequency Transformer. We have prepared a leaflet telling a great deal about this wonderful unit, with instructions for hooking it up in various types of circuits, showing its use not only as a Radio Frequency Amplifier Tuner, but also as an interference and static eliminator or strainer. This leaflet is furnished with each R. F. A. T., or will be mailed to anyone upon request. Price \$4.00.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for general catalog and leaflets.

CROSLEY MANUFACTURING CO.

DEPT. QST 3

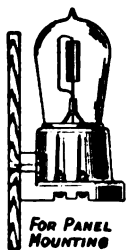
CINCINNATI, OHIO

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

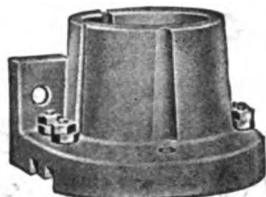
8

CROSLEY RADIO PARTS shown on these pages are the personification of economy and efficiency. The fact that they are endorsed and used by the best Radio Men in the country should be sufficient testimonial.

CROSLEY
Better—Cost Less
RADIO

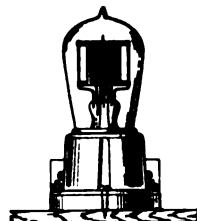


FOR PANEL MOUNTING



CROSLEY V-T SOCKET

This socket has been pronounced by many radio engineers as the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency, service and practical unbreakability. Patents pending. Beware of imitators.
Made of porcelain for base, or panel mounting.....\$0.50

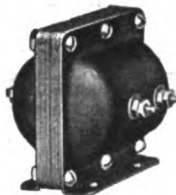


FOR BASE MOUNTING

CROSLEY SHELTRAN

Incorporated in the design of the CROSLEY SHELTRAN, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The CROSLEY SHELTRAN is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.

Better—Costs Less—\$4.00



CROSLEY VARIO-COUPLER PARTS

The CROSLEY VARIO-COUPLER is made with the same accuracy as the CROSLEY VARIO-METER, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.



Complete as shown in illustration, ready for assembly—\$1.50. Also furnished completely wound and assembled. "Better—Costs Less"—\$3.00



CROSLEY BINDING POSTS

These are made in three sizes — $\frac{3}{8}$ " diameter, $\frac{1}{2}$ " diameter and $\frac{5}{8}$ " diameter. They are all of the same design, however, as shown in the illustration.

No. 1..... 5¢ each
No. 2..... 7½¢ each
No. 3..... 10¢ each

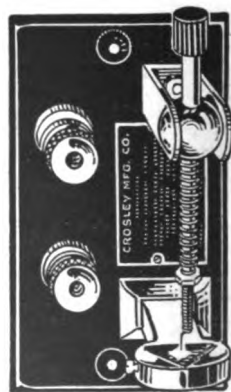
CROSLEY MAGFON

No Radio station is complete without this MAGFON. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the CROSLEY MAGFON by simply inserting it in the back of the cabinet. Mahogany finished \$10.00.



CROSLEY CRYSTAL DETECTOR STAND

This unit is especially well constructed neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystals, binding posts, etc., manufactured under the following patents: "Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 23, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement. —\$1.60.



Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog.

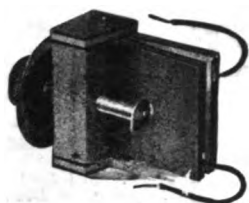
CROSLEY MANUFACTURING CO.
DEPT. QST 3 CINCINNATI, OHIO

CROSLEY

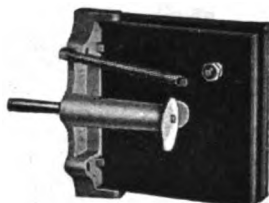
Better—Cost Less

RADIO

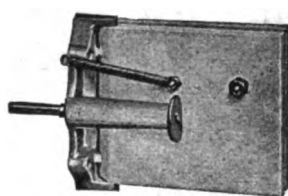
CROSLEY RADIO PARTS are manufactured from the best materials money can buy and are the acme of quality. We draw your especial attention to the CROSLEY patent BOOK-TYPE VARIABLE CONDENSER which impartial tests show to have less resistance than any other condenser on the market.



MODEL A



MODEL B

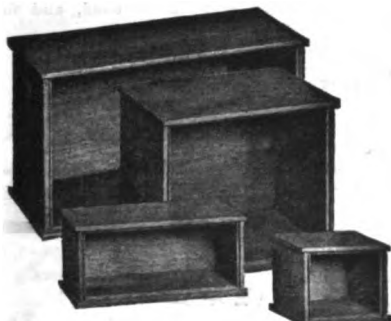


MODEL C

CROSLEY VARIABLE CONDENSERS

The CROSLEY VARIABLE CONDENSERS are unquestionably one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

Model A, .0005 Mfd. (Wood Frame).....\$1.25
 Model B, as illustrated, .0005 Mfd.....\$1.75
 Model C, .001 Mfd. (Porcelain Plates).....\$2.25



CROSLEY RADIO CABINETS

Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish, and of the best workmanship.

The Crosley Radio Cabinets are made of hardwood Adam brown mahogany finish. Live dealers handle them—prices and sizes in our catalogue.

CROSLEY KNOB AND DIAL



Attractive and inexpensive CROSLEY KNOBS and DIALS are extremely well made for all required purposes. The dials are made of solid hard rubber 2½ in. diameter, with the letters and figures moulded into them and white enameled.

Furnished Standard for ¼" shaft or ⅜" shaft, optional—\$0.40.

CROSLEY RHEOSTAT

Note the new Crosley Rheostat with ball bearing contact, patent pending.

This rheostat permits exceptionally accurate and delicate variations of the filament current. With it, the best possible results are received from expensive vacuum tubes.

Unique construction allows the CROSLEY RHEOSTAT to be mounted on a panel of any thickness up to and including ¾ inch. A special grade of non-corrosive wire forms the resistance and results in highly efficient service.

This rheostat is much more attractive, works better and is easier to assemble than the old Crosley Rheostat. It is better in every way and yet the price is the same.....60¢



CROSLEY TAP SWITCH



The unique construction of CROSLEY TAP SWITCHES assures a constant tension and eliminates all possibility of the switch loosening and developing a faulty contact on the taps. A stationary washer of our own design has a soldering lug which makes possible a bus wire connection. All CROSLEY TAP SWITCHES are furnished with a newly designed tapered knob and nickel-plated switch arm and bushing.

Price each complete.....30 cents

Switch Taps for the above made of brass, nickel-plated and complete with brass nut, 2½ cents each.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog

CROSLEY MANUFACTURING CO.
 DEPT. QST 3 CINCINNATI, OHIO

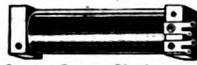
Kellogg Radio Equipment for Better Results



No. 69A. Head Set



No. 2.
Tube Socket



Iron Core Choke Coil



Air Choke Coil

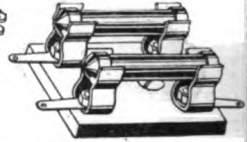


No. 502.
Grid Condenser
Grid Condenser



No. 501. Plug

No. 501. Jack



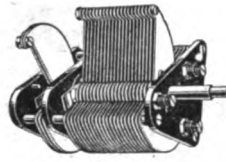
No. 503. Grid Leak and
Condenser on Double
Mounting



No. 501. Dial



No. 501. Variometer



No. 605
Variable Condenser



No. 21. Microphone

KELLOGG STANDARD RADIO APPARATUS

is made in standard resistances and ratings. Only the highest grade material is used, and first-class workmanship assures a product that guarantees high efficiency and durability.

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Kellogg Switchboard & Supply Company
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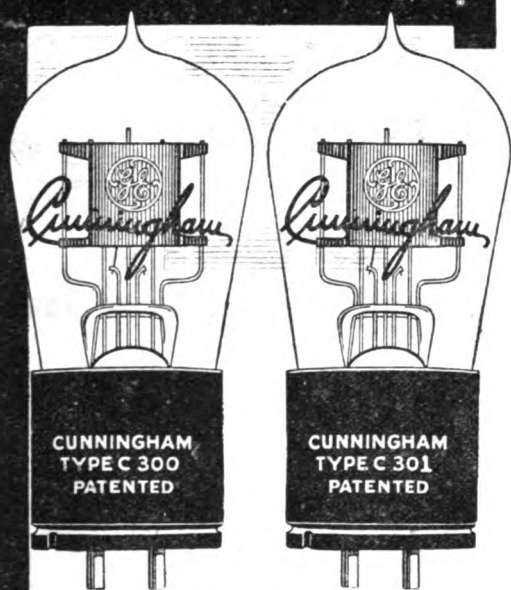
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Murdock, Wm. J. Co.
Radio Distributing Co.
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DETECTOR
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Amplifies
as it
Detects

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HIGH VACUUM
AMPLIFIER
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DETECTOR**

**Distortionless
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*Nationally recognized stand-
ards for all types of*

**RADIO RECEIVING
SETS**

CUNNINGHAM VACUUM TUBES



The trade mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

PATENT NOTICE

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental use in radio communication. Any other use will be an infringement.

Written indelibly in the annals of radio progress is the record of Cunningham service in placing before the public, vacuum tubes of the highest conceivable standard.

The rapid expansion of radio telephony, now one of the world's foremost utilities, was made possible by the wonderful development of the vacuum tube.

The CUNNINGHAM SUPER-SENSITIVE DETECTOR and DISTORTIONLESS AMPLIFIER TUBES, designed and built in the great laboratories of the General Electric Company, are now nationally recognized as standards for all types of receiving sets.

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THAT RADIATES
QUALITY**



Remler No 93A Battery
Pyranometer Price 75¢



Remler No 100 - 3" Bakelite Dial
and Knob 3/16 gr 1/8 shaft
Price 75¢



Remler Type 500 Bakelite Meter
Variometer Price 1.75



Remler No 40 Bakelite
Coil Plug Price 60¢



Remler No 42 Bakelite
Panel Plug Price 60¢



Remler No 43 Bakelite
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Remler No 46 Bakelite
Coupling Plug with
Binding Posts Price 40¢



Gibbs-Remler Inductance Coils 20 to 150 Turns
Maximum Inductance and Minimum Distributed
Capacity



Remler No 48 Coil Mounting
20 to 750 turn coils Price 80¢



Remler No 48 Coil Mounting
20 to 750 turn coils Price 80¢



Remler No 49 Coil Mounting
1000 to 1500 turn coils
Price 75¢



Remler No 813 Heavy Duty Rheostat
Panel type Price 3 amps
carrying capacity \$1.75



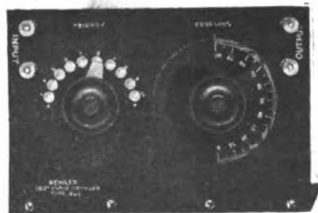
Remler No 810 Junior Rheostat
Panel type Price 1.45 approx.
carrying capacity \$1.00

WHY REMLER STANDS

Pictured on these two pages is the famous Remler line of Quality Radio Apparatus built to serve the needs of the Amateur—built from the Amateur's point of view. Look the Radio field over—you will find that Remler Apparatus is often copied in design, but never equalled in quality. It is designed right, built right, priced right, and works right. It is the Quality Apparatus—sold under a genuine guarantee.

We urge you to look the Radio market over—to get Remler alongside any

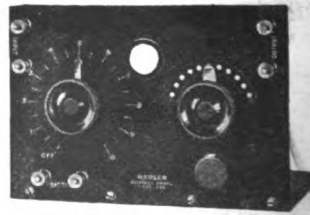
REMLER RADIO
Home Office:
248 First Street, San Francisco, Calif.



Remler Type 505 Panel Mounted
Vario Coupler Price \$12.00



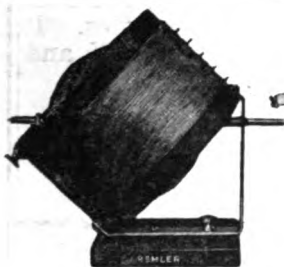
Remler Type 502 Panel Mounted
Variometer Price \$10.50



Remler Type 330 Detector
Panel Price \$8.50

APPARATUS *Radio*

**STANDARDIZE
ON
REMLER**



Remler Type 503-180° Wave Coupler
Price \$5.40



Remler No 90-1 1/2" Bearing
Switch Price 75¢



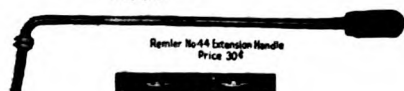
Remler No 82-1 1/2" Plain
Lever Switch Price 90¢



Remler No 84-1" Plain Type Lever
Switch 1/4" Collar Price 60¢



Remler No 91-1" Bearing Type
Lever Switch Price 60¢



Remler No 44 Extension Handle
Price 30¢



Remler No 400 3-\"/>



Remler No 85-N.P. Binding
Post 1/2\"/>



Remler No 86-N.P. Binding
Post 1/2\"/>



Remler No 92 Bakelite Molded
V.T. Socket Price \$1.00



Remler No 83-1\"/>



Remler No 95-1\"/>



Remler No 84-1 1/4\"/>



Remler No 10-1 1/4\"/>

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make of Radio Apparatus—results are its best sales argument—we leave it to your better judgment. See your nearest Radio dealer today—standardize on Remler Apparatus—it Radiates Quality.

NEW REMLER CATALOG

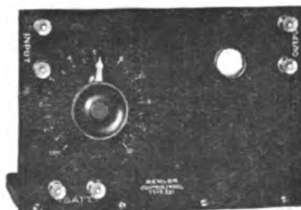
Send 10c for new 40-page Remler Catalog just off the press, containing circuit diagrams for Remler Apparatus and other useful information, including a table of inductance, capacity and wave length.

MFG. COMPANY

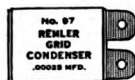
Eastern Representative:
154 W. Lake Street, Chicago, Illinois



Remler Type 335 Amplifier Panel
less transformer Price \$9.00



Remler Type 331 Amplifier Panel
less transformer Price \$6.00



Remler No 97 Grid Condenser
Price 20¢



Remler No 96 Variable Grid Leak
Price 40¢

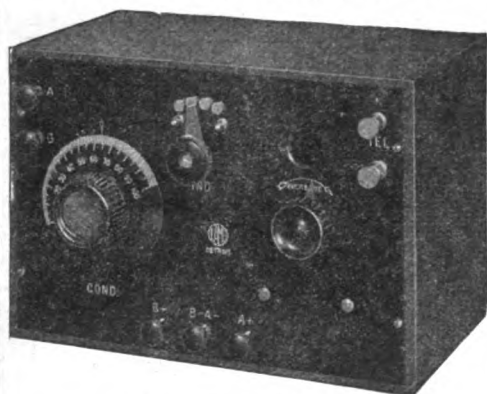
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Type RVD-1

Complete assembly of parts all ready to BUILD YOUR OWN. A Vacuum Tube Receiver that produces wonderful results. A set that will give you real service. Shipped in attractive box complete with blue print of wiring connections and instructions for assembly.

"You will be proud of your set"



It's Perfect!

AND ONLY

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With an approximate range of 100 miles Radius and often more. Can be used with 2 Stage Amplifier and loud speaker.

Wave length 150 to 600 Meters.

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It means over fifteen years of practical radio experience and the best radio engineering principles. It means QUALITY, ACCURACY, and DEPENDABILITY.

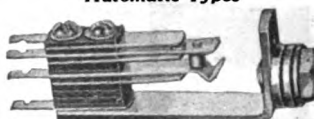
PACENT RADIO JACKS

Standard Types



- | | |
|----------------------------|--------|
| No. 61 Open Circuit..... | \$0.70 |
| No. 62 Closed Circuit..... | .85 |
| No. 63 Double Circuit..... | 1.00 |

Automatic Types



- | | |
|----------------------|--------|
| No. 65—3 spring..... | \$1.00 |
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Specifications: Pacent Jacks

Coin Silver Contacts
Genuine German Silver Springs
Nickel Plated Brass Frames (not Iron)
Micarta Insulation (not Fibre)
Extra Booster Springs
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Rugged Construction thruout
All Details Precisely Accurate
Provided with THREE WASHERS
Fits any size panel 1/8" to 3/8"

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AUTOMATIC ELECTRIC HEAD SETS are the perfected product of thirty years' telephone engineering. This long experience is your protection.

Whether used with crystal, amplifier or loud speaker, there is no distortion nor foreign noises.

Jobbers and Dealers:
Write for discounts and full particulars about our Jobber-Dealer plan.



The natural tone quality of voice or instrument is faithfully reproduced.

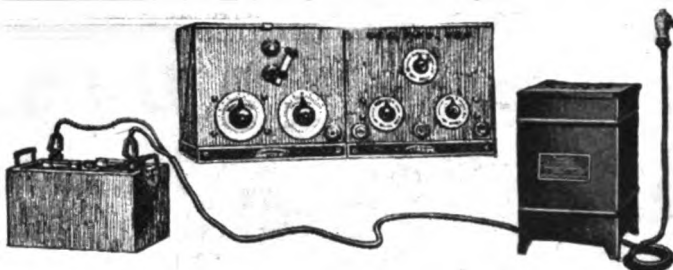
PRICE
at all Good Dealers **\$10**

With Plug Attached **\$11.50**

Automatic Electric Company

ENGINEERS, DESIGNERS & MANUFACTURERS OF THE AUTOMATIC TELEPHONE IN USE THE WORLD OVER

HOME OFFICE AND FACTORY: CHICAGO, U. S. A.



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CONVENIENT AND ECONOMICAL BATTERY CHARGING

Didn't it ever occur to you that you could have a charging station for your radio battery right in your own home? All you need is a source of alternating current supply and a Tungar Battery Charger.

At an insignificant cost for current you can do your own charging, saving money, time and trouble.

The Tungar Battery Charger has been used for years for charging automobile storage

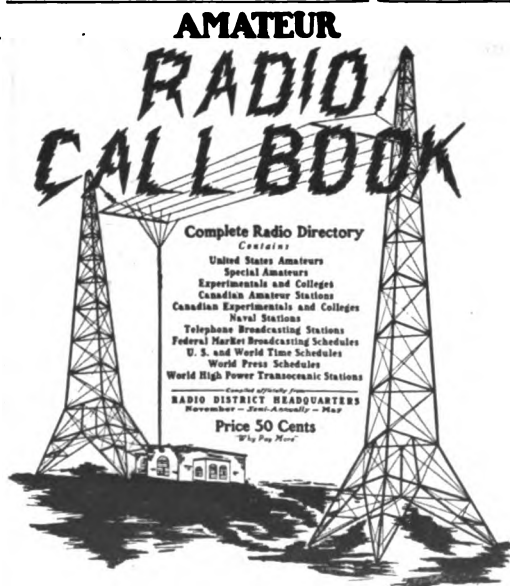
batteries. You are, therefore, taking no chances in buying this charger. There are two sizes of Tungar: the larger size charges 3 cells at 5 amperes; the smaller, 3 cells at 2 amperes. Your battery can be completely charged for a few cents.

An overnight charge once or twice a week will keep a radio battery in perfect condition for average service. Ask your nearest dealer in radio supplies for a Tungar or write us for further information.

General Electric Company

General Office
Schenectady, N.Y.

Sales Offices in
all large cities



Amateur Radio Call Book FIFTY CENTS

Why Pay More

Contains all changes of address, Re-assigned Calls, Cancelled Calls—right up to date of issue—way ahead of any other Call Book at any price. Complete up to date Canadian list. Buy one, look it over, if it isn't the best you have ever seen, write us, money cheerfully refunded, at your dealer or direct from us. Postpaid.

Citizens Radio Service Bureau

416 S. Dearborn Street, Chicago

Dealers, write for Guaranteed Sales Plan.

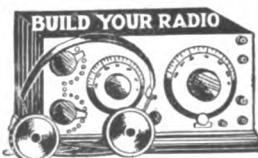
SPECIAL RADIO EQUIPMENT

Prices Quoted Upon Receipt of Specifications
Machine work and panel drilling. Plans and diagrams made for special receiving and transmitting sets:

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MEDFORD, MASS.



SAVE MONEY

Build Your Own At Home
Complete Standard Parts
for Long Distance Radio
Outfits. We do all machine
work; you do the
hand work; we tell you
how. Immediate delivery.
Also complete Radio
Sets—all sizes at bargain
prices. Write now for our big
bargain catalog.

Colonial Radio Equipment Co. Dept. 12, Chicago, Ill.

THE "POT~RHEO"

A combined Potentiometer and Rheostat for \$3⁰⁰

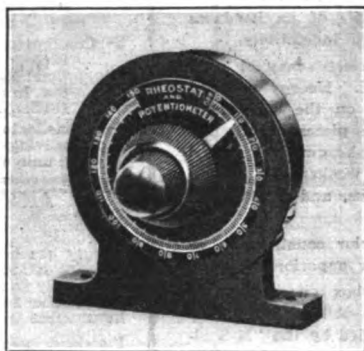
THE development of radio has now created a need for both a potentiometer and a rheostat in vacuum tube circuits, not only for the operation of gaseous detector tubes, but for radio frequency amplification.

The Acme Apparatus Company has successfully developed the "Pot-Rheo" which is a most effectual combination of a 200 ohm potentiometer and a 4 ohm rheostat in one mounting.

The "Pot-Rheo" not only reduces space in either panel or table type set, but through a by-pass condenser provided by the insulation between the concentric shafts which supplies a radio frequency path to the filament it eliminates the necessity of high frequency currents passing through the po-

tentiometer winding back to the filament—a distinct improvement. Separate controls are furnished in convenient proximity. You'll like the "Pot-Rheo" when you see its neat appearance—you won't give it up once you've tried it out. It's an essential.

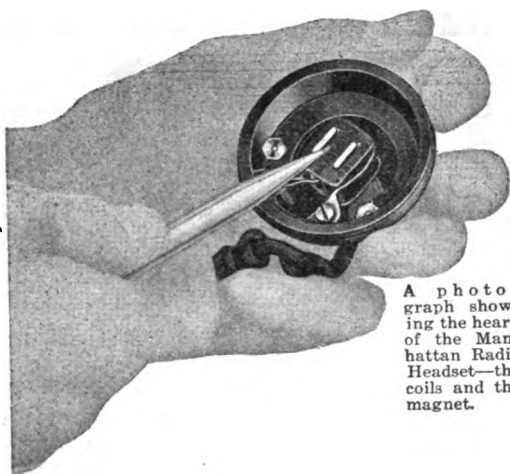
The Acme Apparatus Company also make radio and audio frequency transformers, amplifier and detector units, the Acme-fone and the famous Acme Klee-speaker. This company is also the foremost manufacturer of (C. W.) continuous wave transmitting apparatus. Any reliable radio or electrical dealer has Acme Apparatus or can secure it for you at twenty-four hours notice. The Acme Apparatus Co., Cambridge, Mass., U. S. A. New York Sales Office Broadway.



THE "POT-RHEO"
Price \$3.00 East of Rocky Mts.

ACME

for amplification



A photograph showing the heart of the Manhattan Radio Headset—the coils and the magnet.

It's What's Inside the Receiver Case That Counts

REMOVE the cover of a Manhattan Radio Headset.

Note the large horse-shoe magnet. It is made of Tungsten Steel—the most expensive material for permanent magnets, and the best because of its hardness and property of retaining magnetism indefinitely.

In the center of the case is the electro-magnet with its pole pieces made of Silicon Steel. Energy received from a wireless message is exerted on the diaphragm through the pole pieces. If the pole pieces absorb any of this energy, the pull on the diaphragm is less and the performance of the Headset weakened. Silicon Steel pole pieces cut down energy loss, and give strong signals.

These are two points in the interior construction of Manhattan Headsets which make for superiority.

Look for the Manhattan Headset box on your radio dealer's shelf. It's illustrated below. All genuine Manhattan Radio Headsets may be identified by the "M-Seal-Flash" on the back of each receiver case. It's your guarantee of quality.



Makers of the famous Red Seal Dry Batteries

New York 17 Park Place	Chicago 114 So. Wells St.	St. Louis 1106 Pine St.
	San Francisco 604 Mission St.	

Next month we will tell you more about the "heart of the Manhattan Headset."

No. 2051
3000 Ohms
\$7.00

No. 2500
2000 Ohms
\$6.00



HOMCHARGE



your
**RADIO
BATTERY**
for
A NICKEL

No muss, trouble, dirt—no moving of batteries—loss of time—no technical or professional knowledge needed. May be used right in your living room.

THE RADIO HOMCHARGER DE LUXE

charges your "A" or "B" battery over night and is the only rectifier on the market combining the following essential HOMCHARGING features:

- 1—Simplicity itself—attach to any lamp socket and connect battery.
- 2—Self-polarizing. Battery may be connected either way and will always charge.
- 3—Fully automatic in operation—gives taper charge—cannot overcharge or injure your battery.
- 4—Safe. All parts entirely enclosed. No danger from fire. APPROVED BY UNDERWRITERS EVERYWHERE.
- 5—Constructed of the best material—genuine Bakelite panel, Jewell Ammeter, closed Core Silicon Steel Transformer. No castings used, only the best stampings throughout. UNQUALIFIEDLY GUARANTEED.
- 6—No delicate bulbs to break or burn out. Only one moving and two wearing parts, replaceable as a unit, at small cost.

AN ORNAMENT FOR YOUR LIVING ROOM

Beauty has been combined with utility in the NEW RADIO HOMCHARGER DE LUXE. The body is beautifully finished in mahogany and gold. Equipped with rubber feet, it cannot mar polished surfaces. It harmonizes with the finest living room.

Furnished complete. No extras to buy. Price, \$18.50 at all good dealers, or shipped prepaid upon receipt of purchase price.

Booklet illustrating the NEW RADIO HOMCHARGER DE LUXE in actual colors is FREE for the asking. Send for your copy today.

DEALERS—JOBBER: Over 150,000 HOMCHARGERS will be sold this fall and winter. Send for "HOMCHARGER Business Builders" and Discounts and see how you can get your share of this business.

The Automatic Electrical Devices Company

127 West Third St. - CINCINNATI, O.

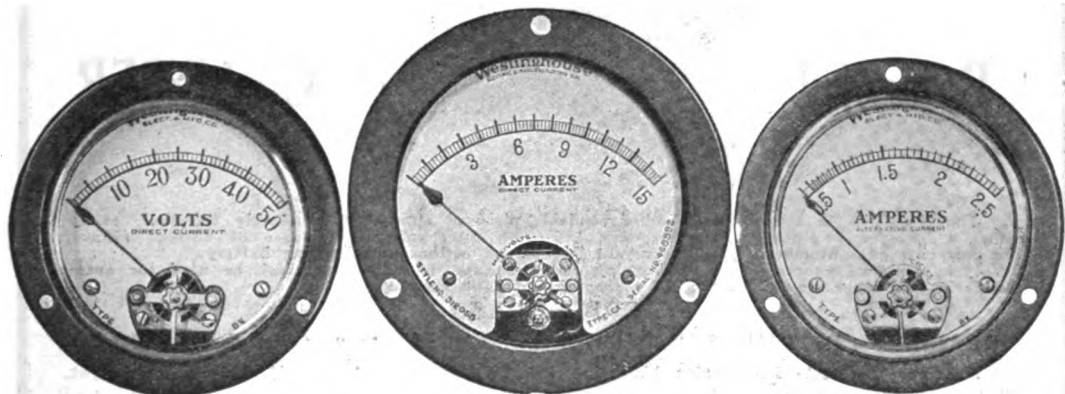
*Largest Manufacturers of Vibrating Rectifiers
in the World*



— OVER 50,000 IN USE —

Send For Folder 4471-A

It tells an important story
about Radio Instruments



Type BX Voltmeter

Type CX Ammeter

Type BX Radiation Ammeter

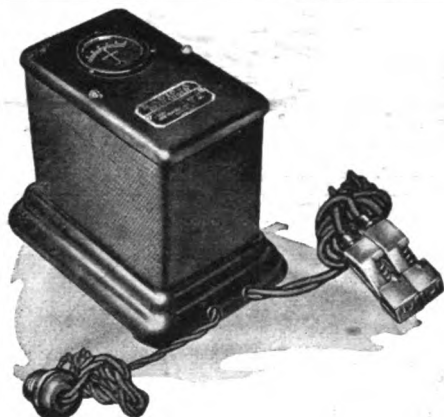


Every Radio Receiving Set
should have its proper
equipment of measuring
instruments; an Ammeter
for determining the fila-
ment current; a Voltmeter
to tell the condition of the
battery.

**Westinghouse
Electric & Manufacturing Co.**
Newark Works: Newark, N. J.

Westinghouse

Reliable
And
Beautiful



RADIO-A
RE-
CHARGER

The RADIO-A is a highly efficient dependable piece of apparatus, absolutely foolproof, easily attached by simply plugging into ordinary 110 volt lamp socket. In case of current failure, the unit cuts out automatically until current is resumed, without discharging battery.

It is designed expressly for re-charging radio filament batteries, but may be used for automobile or any other storage battery of reasonable size and capacity.

PRICE \$18.50

DEALERS & DISTRIBUTORS: Here's a winner. Write us for full particulars.

A compact portable Re-charging Unit that will fully charge a 100 A. H. Battery over night, for from 5¢ to 10¢ according to prevailing rates.

Simply screw into any 110 volt lamp socket and connect the terminals to your battery. Impossible to hook-up wrong—RADIO-A charges either way.

LASTS A LIFETIME

KING ELEC. MFG. CO., INC.

1681 FILLMORE AVE.,

BUFFALO, N. Y.

AUTOMATIC FILAMENT CURRENT ADJUSTER



\$1.10 WITH MOUNTING

Eliminates Rheostats in all amplifying circuits.

Operates vacuum tubes at greatest efficiency without adjustments of any kind.

Automatically keeps filament at proper temperature thereby prolonging life of tubes from two to three times, and preventing "burning out."

Eliminates need of measuring instruments. Easily attached, simplifies wiring, permits compactness, improves appearance of panels and sets.

Must be used in every vacuum tube circuit in order to insure continuous operation at maximum efficiency.

Used as standard equipment by leading manufacturers.

AMPERITE

Manufactured by

RADIALL COMPANY

**99 WARREN STREET
NEW YORK**



BUILD YOUR OWN. 50¢ instruction book for 20¢ on how to make eight classes receiving sets from two slide tuner to combined radio—audio frequency outfits. With every order you receive price list of parts illustrated in book. Buy direct from factory and save dollars. Both text book and catalog mailed for 20¢.

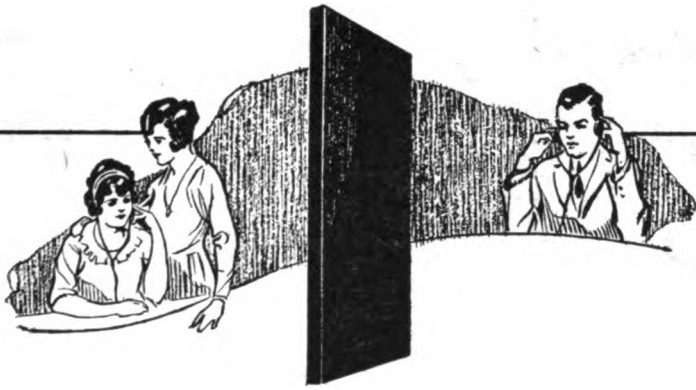
**Dept. 13. RADIO PARTS MFG. CO.,
Was: Park Place, Detroit, Mich.**

Boys and Girls Earn Christmas Money

Send for 50 sets of our famous XMAS SEALS, STAMPS, ETC.—Sell for 10¢ a set. When so'd send us \$3.00 and keep two dollars. We trust you. Don't delay. Write today.

NEUBECKER BROS.,

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Buy FORMICA Radio Panels

Because they look better.

Because they work more easily.

Because they have the highest dielectric strength.

Because they defy moisture, and do not warp.

Because their uniformity is remarkable.

Because they are approved by the navy and signal corps.

Because radio men everywhere have come to prefer them.

Your dealer has Formica or can get it. We can refer him to a wholesale stock in his locality. Our own large capacity makes immediate delivery possible.

DEALERS: A stock of Formica carries with it important advertising and sales cooperation. The demand for Formica quickly clears your shelves.

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Cincinnati, Ohio

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422 First Avenue...Pittsburgh, Pa.
1210 Arch Street.Philadelphia, Pa.
Sheldon Bldg...San Francisco, Cal.

FORMICA

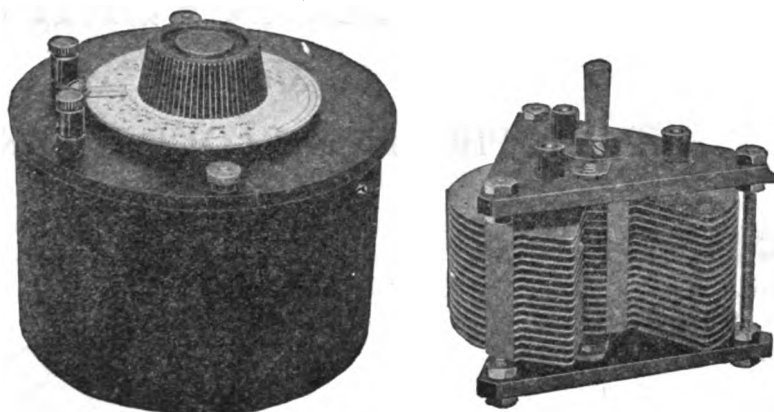
A Laminated Phenolic Condensation Product

SHEETS TUBES RODS

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

97

A CORRECTLY DESIGNED CONDENSER



TYPE 247 CONDENSER

The long experience of the GENERAL RADIO CO. in designing and building high grade radio apparatus for laboratory use has enabled us to design this low loss condenser for the citizen radio field. This condenser is of laboratory quality, yet sells at a price within reach of the experimenter. Its losses are less than one fourth of those of the ordinary condenser on the market.

Consider some of its features:

CAPACITY SCALE: In addition to the regular scale divided into 100 equal divisions, the dial is also graduated in micromicrofarads, thus showing the capacity at any setting.

LOW DIELECTRIC LOSS: Hard rubber is the only solid dielectric used. The quantity used is small and so placed that the dielectric losses are kept a minimum. This is very important in obtaining sharpness of tuning and is commonly overlooked in condenser construction.

BRASS PLATES SOLDERED TOGETHER: Resistance is reduced and kept constant. The rigidity of the brass and adequate spacing minimizes the danger of short circuiting.

SPECIAL SPRING BEARINGS: Tension always the same. Good contact insured.

THRUST ALL IN ONE BEARING: No short circuiting if the distance between bearings becomes changed.

LOW ZERO CAPACITY: Makes a wide wavelength range possible.

METAL CASE GROUNDED TO ROTARY PLATES: The condenser is shielded, reducing the capacity effects of the hands, while tuning.

Type 247A—.001 M. F. Mounted, Shielded Price, \$6.00

Type 247B—.001 M. F. Unmounted, with Counterweight . . Price, 3.75

Type 247E—.0005 M. F. Mounted, Shielded Price, 5.50

Type 247F—.0005 M. F. Unmounted, with Counterweight . . Price, 3.25

This condenser is but an example. We manufacture a complete line of the finest radio instruments and parts.

SEND FOR FREE RADIO BULLETIN 911Q

GENERAL RADIO COMPANY

Massachusetts Avenue and Windsor Street,
Cambridge, 39, Massachusetts

Standardize on General Radio Company Equipment Throughout.

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.



ROLLER - SMITH

"Universal"

'PHONES and LOUD SPEAKERS

Reproduce faithfully, without distortion and in large volume from the deepest to the highest voice and musical notes. 'Phones 3,000 ohms, **\$6.50**. Loud Speakers **\$18.00**. Backed by a year's guarantee that means something.

Send for new Bulletin No. AG-20.

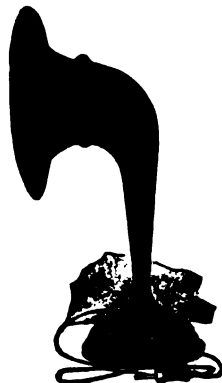
Distributors write for attractive proposition.

ROLLER-SMITH COMPANY
Electrical Instruments, Meters and Circuit Breakers

MAIN OFFICE:
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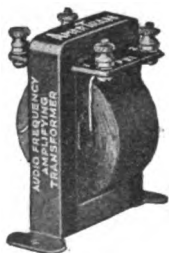
WORKS:
BETHLEHEM, PA.

Offices in principal cities in United States and Canada



The AMERTRAN

**Amplification
Extraordinary**



Price, \$7

Ask your
Electrical Dealer
Or, sent carriage
charges collect
(Wt. 1 lb.)

A good amplifying transformer in one stage might give audibility amplification of 20; in two stages, 400. One AMERTRAN with Radiotrons gives 38.6; two stages, 1490, or nearly four times the ordinary type—and without distortion.

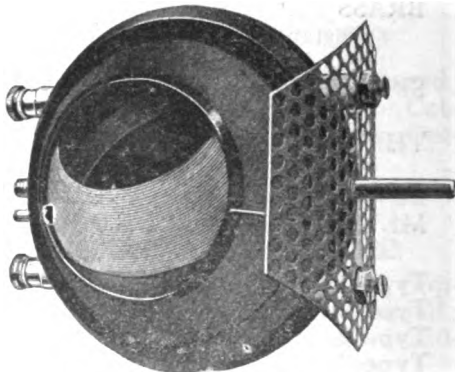
In volume and pure tone quality, for nearby broadcasting as well as for long distance reception, its supremacy is immediately apparent.

American Transformer Company

Designers and builders of radio transformers for over 20 years.

176 Emmet St., Newark, N. J.

THE LAST WORD IN



Precision Variometers

Spaced bare lacquered wire prevents leakage and capacity effects.

Shells of newly discovered composition only .025" thick prevent dielectric hysteresis.

Perforated shield plate prevents eddy current losses.

Absolutely guaranteed. A superlative instrument.

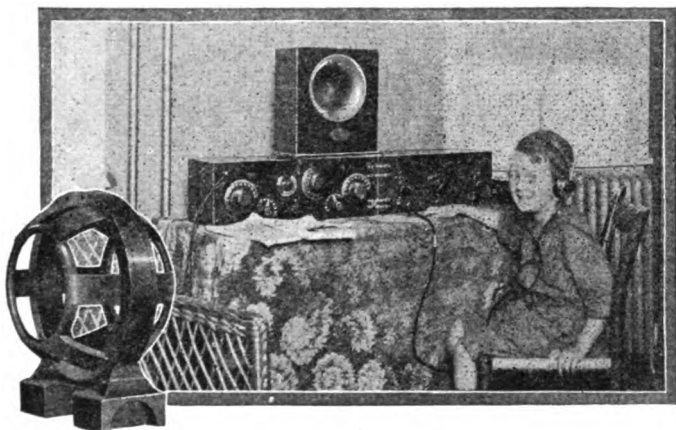
Price ready for mounting—Variometer....\$7.50

Variocoupler... 8.00

Write for Sample Shell Coil

Dealers write for discounts.

HORTON CORP.,
Ridgefield Park, N. J.



Perfect operation insures enjoyment

THIS molded Variometer Stator Frame possesses every desirable quality. It can be formed exactly as desired to hold the proper windings and combines the necessary mechanical strength with high insulating and dielectric properties.

Fine finish and appearance as well as exact dimensions, are acquired in the molding, and further polishing or tooling is unnecessary.

Unaffected by atmospheric and temperature variations, or by moisture, these molding materials have also the additional advantage of being resistant to oils and most chemicals and fumes.

Minute accuracy, strength, both dielectric and mechanical; permanence and stability—these qualities alone have justified this material for scores of applications. And simplicity of reproduction is demonstrating again and again that the best is actually cheapest in the end.

BAKELITE CORPORATION

Each Division welcomes inquiries from manufacturers, and maintains a research laboratory for the working out of new applications.

Condensite

Condensite Company
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Bloomfield, N. J.

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Redmanol Chemical
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Chicago, Ill.

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After the
**THANKSGIVING
DINNER** hear the voice
of the Outer World~

EXCEPT for signal reception, the clear and powerful **Magnavox** Radio, the Reproducer Supreme, has replaced the individual headset in every well equipped station.

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. \$85.00

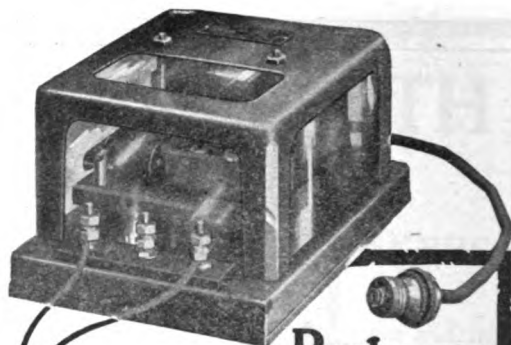
R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc. \$45.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. 2 Stage . \$80.00
3 Stage 110.00

Magnavox products can be had of good dealers everywhere. Write us for copy of new illustrated booklet.

THE MAGNAVOX CO.
Oakland, California
N. Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio
The Reproducer Supreme



Recharge Your Battery at Home

Charges both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a **Valley Charger** and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge it or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parallel so that they can also be charged.

SATISFACTION GUARANTEED.

If your local distributor cannot supply you, write direct to

VALLEY ELECTRIC COMPANY
Department Q, ST. LOUIS

----- Mail the Coupon -----

Valley Electric Co., Dept. Q, St. Louis, Mo.

Gentlemen: I am enclosing money order (or check) for \$18.00, for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory I will return it and get my money

Name

Address

\$18.00

F.O.B. St. Louis



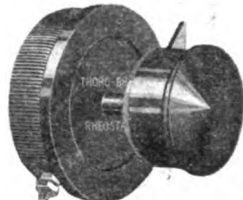
The Thoro-bred Dial Type CR-5. This "raised axis" keeps the edges of the dial $\frac{1}{8}$ " from your panel at all times, effecting easy operation and no scraping of panels. Combining all features essential to perfect operation without friction and other difficulties. One of the indispensable trio. Price 90¢.



The Thoro-bred Rheostat. Type R-90. Has a resistance of five ohms. No vernier adjustments necessary. Adaptable for either table or panel mounting. Silver plated, highly polished. One of indispensable trio. Price \$1.10.



Thoro-bred Tube Socket Type S-12. Base of molded Bakelite which unlike ordinary shellac compositions used, reduces leakage to a minimum. Price \$1.00.



The Indispensable Trio

THE Thoro-bred Rheostat, Dial and Vacuum Tube Socket are an indispensable trio for every tube set. Without these three you will not know the best results your receiving set can give. Here's why.

The Thoro-bred Rheostat enables you to secure the maximum detector action through its extremely close adjustment of the filament control. It has a resistance of five ohms, which eliminates the use of a vernier adjustment, since the resistance of one of its turns of wire on the resistive element is so small that the effect is not noticeable on the tube. All metal points are silver plated. It is adaptable for either table or panel mounting. Molded parts are of Bakelite. Knob is supplied with pointer and is of the same design as the dial. Patent applied for. Price \$1.10.

The Thoro-bred Tube Socket is the second of this indispensable trio. The tube insert is of brass, heavy nickel plated

with high polish. The base is of moulded Bakelite, making it possible to withstand high heat. The leakage from the grid to the filament is reduced to a minimum. Bakelite used in the Thoro-bred Socket does not absorb the moisture or cause the leakage as in other sockets employing the common shellac composition. It gives a better appearance and holds the original finish. Price \$1.00.

The Thoro-bred Dial was the first genuine Bakelite dial to be offered with both Clock-wise and Counter-Clock-wise Readings. This dial was also the first to introduce the popular "raised axis" which eliminates all panel scraping and friction and permits easy operation. The Brass insert employed—does away with any wobbliness that might otherwise develop. Patent applied for. Price 90¢. The indispensable trio can be obtained at your nearest dealer. If, for some reason he is not already supplied, send us his name, and your money direct.

THE MARSHALL - GERKEN COMPANY
TOLEDO, OHIO, U. S. A.

Thoro-bred

RADIO PRODUCTS

ALWAYS MENTION Q'S WHEN WRITING TO ADVERTISERS

102

Use a REAL Switch Lever—



makeshift stuff never gives you proper results. Look at the good points in the ACE Panel Lever Switch; molded in shaft, therefore Knob cannot work loose—hexagonal shoulder absolutely guarantees blade against turning on shaft—perfect self-cleaning wipe contact at EACH end—spring and cotter pin tension—no nuts to loosen. Absolutely the finest switch lever obtainable. This and other high grade products of our factory listed in our new fall catalog; 10c brings it.

Dept. YB

THE PRECISION EQUIPMENT COMPANY

2437-39 GILBERT AVENUE,

CINCINNATI, OHIO

A WARNING TO THE TRADE!

The popular line of EBY Binding Posts known to the trade as MIDGET, CORPORAL, BUDDY, SERGEANT, SERGEANT "SS," SERGEANT "W," CAPTAIN, MAJOR and GENERAL also COMMANDER "S" insulated posts are all patented.

THE H. H. EBY MANUFACTURING COMPANY as sole licensee under said patent hereby notifies and warns all manufacturers, jobbers, dealers or users not to make, sell or use infringing Binding Posts, and anyone so infringing either directly or as a contributory infringer will be vigorously prosecuted.

We therefore warn the trade not to buy imitations infringing such patent, and thereby avoid expensive patent litigation.

We are in better shape than ever to take care of your requirements for EBY posts and in view of the outlook for big business during the coming Radio season, we cannot too strongly urge you to anticipate your orders.

THE H. H. EBY MANUFACTURING CO., PHILADELPHIA, PA.

B & K PRODUCTS

Variometers	\$4.50
Variocouplers	4.00
Hi-Wave Couplers, 150 to 2500 meters	8.00
B&K Radio Frequency Transformers, 150 to 500 meters.....	3.00
Porcelain Tube Sockets.....	.40
Fada Panel Mount Tube Sockets..	1.00
Fada Rheostats.....	.75
Double Slide Tuning Coils.....	2.25
B&K Unassembled Crystal Detectors	.50

BONDUAUX & KNIGHTS

1115 Kelly Street, Bronx, N. Y.
Write for bulletin No. 1



\$4.00



\$1.25

UNIVOX 90° COUPLER FOR SINGLE—THREE CIRCUIT OR ARMSTRONG SUPER HOOKUP

A high grade unit priced right & unconditionally guaranteed. Formica tubes—Green silk wire. Nickel plated brass fittings. Good design—Perfect workmanship. Bulletin C describes in detail.

UNIVOX FILAMENT RHEOSTAT

Honestly made—Honestly priced Bulletin R gives complete data Splendid discount to the trade.

Walter R. Horning, Inc.
Mfrs. 'UNIVOX' Radio Units
Cleveland, O., U. S. A.

a New Willard "A" Battery for

A new Willard—at a new low price!

That's the Willard FW Radio "A" Storage Battery.

It has Willard-quality plates, selected wood separators, tested rubber jars, well-built acid-proofed container.

It has specially-designed terminals that do away with clips and insure tight, easily-made connections.

It has a special marking for the positive terminal, so that there's no chance of your hooking up the battery in reverse.

It has patented soft-rubber gaskets around the terminal posts to prevent leakage.

It has a stout roller handle that's easy on your hand.

And remember this—

All Willard Radio Batteries Are Shipped Dry and Fully Charged

This means that you are always certain of a fresh battery—a battery in which there has been no deterioration—and *one you can put to work at once without charging.* All that is required is the adding of the electrolyte (a solution of pure sulphuric acid and water) which takes but a moment.

See the new Willard FW Battery at the nearest Willard Station or at your dealer's.

WILLARD STORAGE BATTERY CO.
Cleveland, Ohio

Made in Canada by the

Willard Storage Battery Co. of Canada, Limited,
Toronto, Ont.

\$13.60
40
ampere-hour
capacity



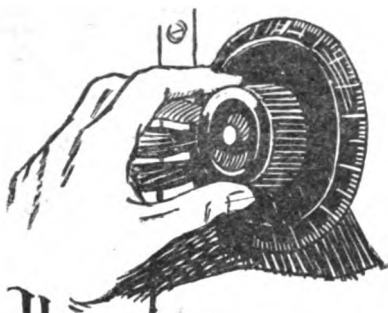
Made in Three Sizes

Capacity and prices of this new battery are as follows: 40 a. h., \$13.60; 80 a. h., \$17.50; 110 a. h., \$22.00. Prices slightly higher west of the Mississippi and in extreme South.

Willard STORAGE BATTERY

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105



How to stop noises when you touch dials

Have you ever noticed in tuning a radio receiving set that when you touch dials, knobs or switches it causes a humming or whistling noise? It is annoying isn't it? These distracting sounds will disappear if you install dials, knobs and other parts made of

RADION

Tests by disinterested laboratories have shown conclusively that RADION is without exception the best material for radio parts and panels because it comes closest to being the perfect insulation.

Have you tried RADION? If not, secure a dial or other part from your dealer today. Take it home and experiment—that's the best way to become convinced of its unusual qualities.

And while at your dealers, ask him to show you a RADION Mahogany panel. Its beautiful mahogany grain will please you. It won't warp and is easy to work. If your dealer cannot serve you, write us direct for all information giving us his name.

Dealers are invited to write for lists.

American Hard Rubber Company
11 Mercer Street, New York

The Triple Test Transformer

What does it mean to you?

In a market glutted with new radio products, some well made, some poorly and cheaply constructed, a few articles stand out prominently from the rest because the manufacturer employs highly competent engineers, the best of material and skilled workmanship. The RADIO SERVICE LABORATORIES goes a step further and submits each individual transformer to its famous triple test before shipping same to the jobber, dealer and ultimate user.

The Triple Test

First—Test of Windings.

The bobbins when wound and sealed are tested for continuity of winding and for shorts and leaks.

Second—Test of Inductance of Windings.

After assembly of the bobbin within the container a careful test is made of the inductance of the primary and secondary windings and the mutual inductance of the windings to insure the consumer against any wrong connections or hasty, careless construction.

Third—Test for Amplification.

After the iron core is assembled and the transformer sealed, each transformer is given an actual circuit test in a radio amplifier; the gain in signal strength being noted over that of the detector tube alone and required to meet the gain of our standard laboratory model.

The Result

is a Radio Frequency Transformer that increases the strength of Radio signals or waves before they are applied to the detector tube where they are made audible—

“Louder Signals with less noise
Greater Range with same equipment”

RADIO SERVICE LABORATORIES Transformers by actual test are superior to any domestic or foreign make in the market. For sale at any electrical shop or store where Radio supplies are sold. Special circular sent on request by the

Rasla Sales Corporation

National Distributors

Dept. B, 10 East 43d St., N. Y. City



The only completely shielded iron core

We don't think even MR. MARCONI would succeed at it



WE'VE never heard of anyone trying to make a radio outfit without magnet wire.

What nerves are to your body, wire is to the apparatus designed to receive or transmit sound through space.

You can take wire for granted, and buy the cheapest you can find—or you can investigate Acme Wire. You will learn that, even at its slightly higher cost, it is likely to save you money in the end, by reducing manufacturing costs; and certain to enhance your reputation, by *performing* as your customers expect your product to behave.

The Acme Wire Co. makes hundreds of thousands of transformer coils in its own plant. It has learned, in the hard school of actual experience, what kind of wire is best adapted to the needs of the radio manufacturer, and has developed the finer sizes of enameled magnet wire to the highest state of perfection known in the industry.

We invite the inquiries of makers and users of radio apparatus who are interested in better materials and lower final costs.

**THE ACME WIRE CO., New Haven, Conn.
NEW YORK CLEVELAND CHICAGO**

Acme Wire

"It goes in the space"

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS



Acme Radio Users

Acme Apparatus Co.
Adams Morgan Co.
Atwater Kent Mfg. Co.
Auth Electrical Specialty Co.
Chicago Telephone Supply Co.
Connecticut Telephone & Electric Co.
Chas. Cory & Son, Inc.
Dictograph Products Co.
Eisemann Magneto Co.
Electrical Products Mfg. Co.
Elwood Electric Co.
Federal Telephone & Telegraph Co.
General Radio Co.
A. C. Gilbert Co.
Holtzer Cabot Electric Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
Standard Transformer Co.
States Co.
Thordarson Mfg. Co.
Wells Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Acme Wire Products

"Enamelite," plain enameled Magnet Wire; "Cottonite," Cotton-covered Enamelite; "Silkenite," Silk-covered Enamelite; Single and Double Cotton Magnet Wire; Single and Double Silk Magnet Wire. We also have a complete organization for the winding of coils in large production quantities.

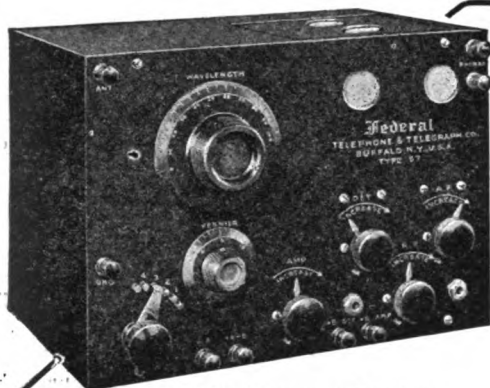
Acme Electrical Insulations

Flexible varnished tubing in all sizes and colors; standard or special.

Acme Radio Specialties

Audio Transformer windings.
Radio Frequency windings.
Magnet windings for Head Sets.
Enameled wire—especially the finest sizes, 40-44 B & S gauge, Silk- and cotton-covered magnet wire.
Enameled Aerial wire—single wire and stranded.

Illustrated Catalog will be sent upon request to Purchasing Agents and Engineers.



No. 57 Radio Frequency Receiver

—go as far
as you like

WITH

Federal RADIO FREQUENCY AMPLIFYING APPARATUS

The FEDERAL NO. 57 RECEIVER combines simplicity and reliability of operation with a sensitiveness that is unrivaled, giving an extraordinarily high degree of amplification and making possible the reception of radio signals over marvelously great distances. It constitutes one stage of Radio Frequency, a detector and two stages of Audio Frequency.

Write for Bulletin No. 119-W

Federal Telephone and Telegraph Company
BUFFALO, N. Y.

ANOTHER BOOSTER for

Bradleystat
REGISTERED U.S. PAT. OFF.
PERFECT FILAMENT CONTROL

Detroit Electric Co., writes as follows:
"Have sold Bradleystats to manufacturers who positively refuse any other rheostat. We have not had any returned for any cause, whatsoever, and will stock them continually."



PRICE \$1.85

P. P. 10¢ extra

Allen-Bradley Co.
Electric Controlling Apparatus

277 Greenfield Av., Milwaukee, Wis.

Mfrs. of graphite rheostats for 20 yrs.



Quality First!

The price of a golf club—a theatre ticket or a pair of phones, should not be reckoned by the amount paid in cash, but by the pleasure and satisfaction derived by the buyer.

The first EVERETT PHONES cost hundreds of dollars before it satisfied the eminent designer. His opinion of what perfect radio telephony should be, is incorporated in the

EVERETT PHONES

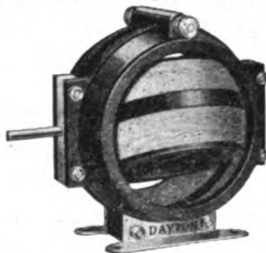
EVERETT ELECTRIC CORP.

320 Broadway,

New York



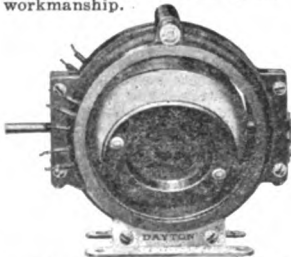
QUALITY has been well defined as "what the public *would* want if it knew all about it." Day-Fan Radio Apparatus is designed from this standpoint and it represents a real improvement in the art of amateur radio reception.



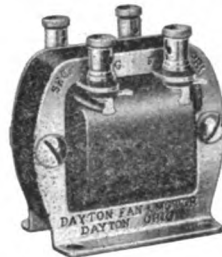
Variometer—Bank wound stator and rotor with low distributed capacity—minimum air gap—wave length range of 140 to 2600 meters when used with variable condenser in the antenna circuit—adjustable for wall, table or panel mounting—mahogany Bakelite with nickel trimmings—small and compact—highest grade finish and workmanship.



Condenser—43 Plate Capacity, .001 Mfd.—23 Plate Capacity, .0006 Mfd.—13 Plate Capacity, .00035 Mfd.—black enamel metal end plate which will not warp—accurate spacing of plates—rotor has adjustable pivot bearing—high power-factor insuring undiminished signal strength.



Variocoupler—A companion instrument to the variometer; of same size and general appearance—bank wound stator—sixteen taps arranged to provide any combination from one to fifty-nine turns—adjustable for three position mounting—may be used directly in antenna circuit with condenser to give a wave length range from 140 to 700 meters. This range may be increased from 100 to 1650 meters by the addition of a variable condenser.



Transformer—Transformation ratio nine to one—highest grade silicon iron—core construction provides double magnetic path of overlapping, insulated laminations which eliminates stray magnetic flux and makes shielding unnecessary—both binding posts and soldering lugs—nickel trimmings—each transformer is tested under service conditions for tone and signal strength.

The Dayton Fan & Motor Co.

Factory and General Offices

Dayton, Ohio





MONARCH

Radio Head Sets

Plugs, Jacks, Keys, Variable Condensers, Variometers, Variocouplers, Cords and Binding Posts were designed and perfected by Engineers who have been producers of high grade communication equipment for the past quarter of a century.

Our reputation is back of the Radio Equipment we offer you. This is your guarantee of the best there is when you see the name "Monarch" on the apparatus. If your dealer cannot supply you, order direct from us.

Inquiries from Jobbers solicited.

MONARCH
Telephone Mfg. Co.
FORT DODGE, IOWA

CODE NUMBERS & LIST PRICES—

No. 1-A-2000 Ohms—Bakelite	\$8.00
No. 1-B-2500 Ohms—Bakelite	10.00
No. 1-C-3000 Ohms—Bakelite	12.00
No. 2-A-2000 Ohms—Composition	7.50
No. 5-A-1000 Ohms—Single Set	4.50

McTIGHE ALKALINE STORAGE "B" BATTERY

for RADIO OUTFITS



The McTighe Storage "B" Battery is the most satisfactory for radio use. It gives 22 volts, is inexpensive--noiseless--cannot be damaged by short circuit, overcharging, standing idle or uncharged. Can be fully charged from any light socket for less than one cent. Is furnished in an oblong glass case which nests neatly. The McTighe Rectifier is cheap, simple, durable, and effective, and should be used when charging the McTighe "B" Battery.

Battery \$5.00, Rectifier \$1.50, Rubber Filler 25¢
F.O.B. Irwin, Pa.

Discount to Dealers Address Dept. Q Prompt shipments

ECONOMIC APPLIANCE CO.
IRWIN, PENNA.

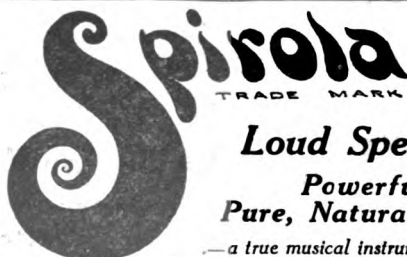
THE WIRELESS WONDER



A Complete Aerial for \$1.50

Simply screw in any lamp socket and turn key on. Better than an outdoor aerial. Nothing to get out of order. Eliminates lightning danger. Money back guarantee.

Radio Catalog free at your dealers or
STEINMETZ WIRELESS MFG. CO.
5706 Penn. Ave., Pittsburgh, Pa.
Electrical Engineers and Manufacturers



Loud Speaker
Powerful
Pure, Natural Tone
—a true musical instrument

You can't afford to buy a loud speaker till you have heard **SPIROLA CONCERT**. You can hear it at your dealer or at our risk—10 day money back trial.

Cabinet type, beautifully finished, complete with special reproducer and cord, prepaid \$12.50.

Drop Us a Card for Particulars

L. H. DONNELL MFG. CO., DEPT. C, BOX 70
ANN ARBOR, MICH.

Static Defeated and Loop Aerials Practical for All

Cotoco

TRADE MARK REG. U. S. PAT. OFF.

BUY by the name Cotoco and you buy Radio supplies that are scientifically and mechanically right. Buy by the name Cotoco and you buy abreast of the latest developments in Radio.

One of the nation's greatest weeklies, in an editorial article, speaks of the "growing popularity of radio frequency." The reason for this nation-wide popularity is that Radio Frequency sets alone have weathered the summer whirlpool of static. More than that, the obvious advantages of Loop Aerials are fully enjoyed by those who use this method.

The name Cotoco is to be found on the best amateur and professional Radio Frequency sets throughout the land.

**Buy Always
by the name
COTOCO**

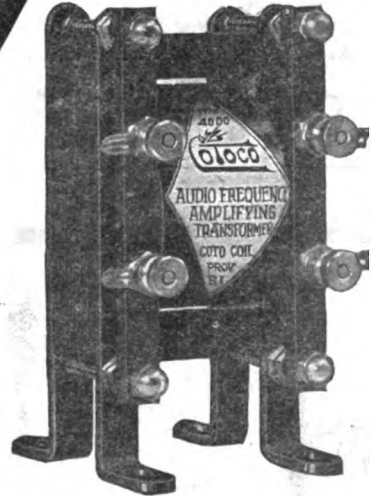
Connection Diagrams are Wrapped

with every Cotoco Amplifying Transformer for Radio Frequency for both two and three stages of Amplification.

If your dealer cannot supply you, send us his name

COTO-COIL CO.
87 Willard Ave.,
Providence, R. I.

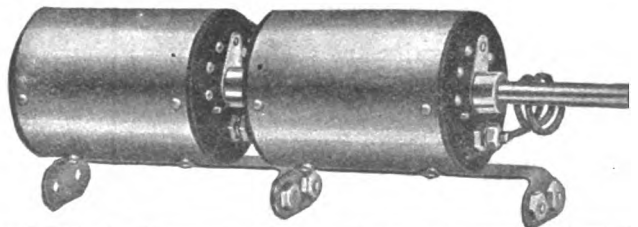
*Write For Free
Connection Diagrams*



**COTOCO AMPLIFYING
TRANSFORMER FOR
AUDIO FREQUENCY**

Above is our Audio Frequency Amplifying Transformer. Distortion practically unknown to its users. Whether through headphones or loud speaker, music and speech come through clear and true.

Below is the wonder working transformer that has had so much to do with the growing popularity of Radio Frequency as opposed to the regenerative principle. Many of the most efficient radio sets made this fall and winter will be built around these compact and efficient tapped transformers mounted for two stages (as illustrated) or three stages of Amplification.

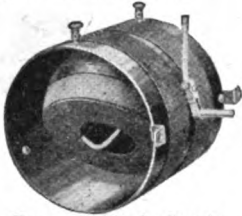


ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

11

DAYTON RADIO PRODUCTS

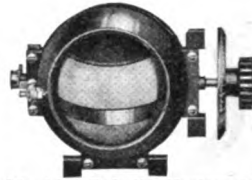
Are the most complete and most accurate of any Radio apparatus made by one Company in America.



Type B Vario-Coupler



Dayton Phone Receiving Set



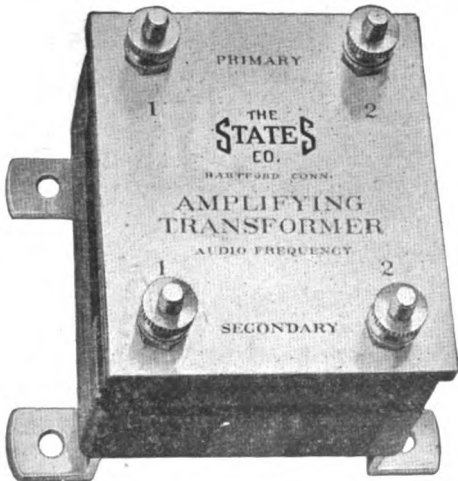
Moulded Bakelite Variometer

VARIABLE CONDENSERS IN 4 SIZES

	List Price
Type 9 P. C. S. Square and Round Plate .0003 Mf.	\$3.00
Type 17 P. C. S. Square and Round Plate .0005 Mf.	3.60
Type 31 P. C. S. Square and Round Plate .001 Mf.	4.50
Type 45 P. C. S. Square and Round Plate .0015 Mf.	5.30
Type 17 P. C. S. Condensers with Vernier attached.	4.40
Type 31 P. C. S. Condensers with Vernier attached.	5.30
Type A Variometer Moulded Bakelite.	6.75
Type A Vario-Coupler Moulded Bakelite.	7.00
Type B Variometer Bakelite Tube Type.	4.25
Type B Vario-Coupler Bakelite Tube Type.	4.75
Type C Vario-Coupler Bakelite Tube Type.	3.75
Rheostats	1.10
Panel Switches 8 Points.	.90
Phone Jacks	.65
Genuine Bakelite Knobs and Dials 3"	.75
Insulating Rubber Tubing 10 ft. Package.	.45
Radio Phone Receiving Sets.	75.00

Jobbers and Manufacturers write for Catalog and Discounts.

THE A-C ELECTRICAL MFG. CO., DAYTON, OHIO
MAKERS OF ELECTRICAL DEVICES FOR OVER 20 YEARS



Cat. No. 20001

SURPRISING results are secured with this A. F. Amplifier. Turns Ratio 1 to 3. **PRICE \$5.00**

Jobbers and Dealers Discounts

THE STATES CO.

72½ Francis Ave., Hartford, Conn.

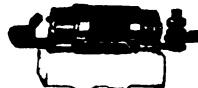
BRACH VACUUM LIGHTNING ARRESTER

**Should Be Featured
In Every Dealer's Stock**

This is the arrester that sells on its merits, therefore sells itself. No one will question its dependability as a protector for radio from lightning and static interference. The Brach Arrester is built up to a standard, not down to a price. Dealers make friends by selling it.



Outdoor Type



Indoor Type

*It Is Listed By the
Underwriters' Laboratories.*

Trade Supplied by Best Jobbers

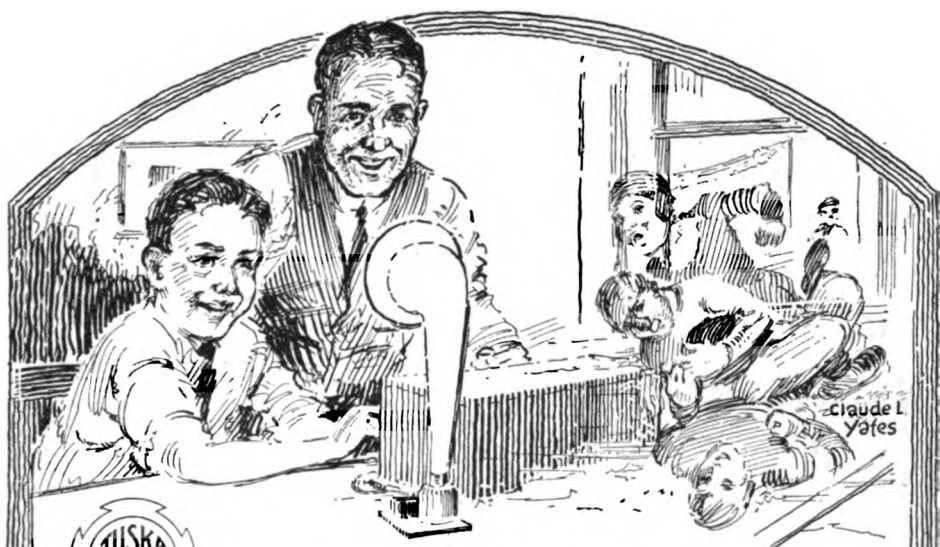
L. S. BRACH MFG. CO.

129 Sussex Ave., Newark, N. J.

16 Years Specialists In Lightning Protective Apparatus.

Also Makers of Solderall—Best for Soldering Radio Connections.

Coast Representatives—Pacific States Electric Co., San Francisco, Los Angeles, Oakland, Seattle, Portland, Spokane.



*Catalog Number Four
contains Marvelous
article on tuning
Receiving Sets.
10 cents
brings it
to you*

TOUCH DOWN!

Football returns by radio have almost the thrill of "TOUCHDOWN"! Perhaps you cannot attend the Big Game. You can get the returns on a TUSKA RADIO RECEIVER!

TUSKA RADIO APPARATUS is the leader. First in Service. Highest in Quality. Best in Price.

Examine TUSKA RADIO at your dealer's today.

THE C. D. TUSKA COMPANY
25 BARTHOLOMEW AVE., HARTFORD, CONN.

TUSKA RADIO

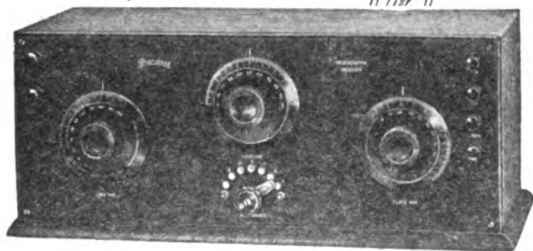
Established 1911

THE STANDARD IDEA



Assembled — But Not Wired

Here is a new way to buy reliable radio equipment—a cheaper way. The STANDARD IDEA enables you to buy high-grade radio instruments, including a Detector and Two-Stage Amplifier and a Multiple Wave Tuner, completely equipped—but not wired. You do the wiring yourself in accordance with the diagrams and instructions furnished with every instrument.



A Clear Saving of 20%

The STANDARD IDEA was adopted to save money for the radio fan. It eliminates the expensive operation of hand wiring in our factory and makes it possible for the purchaser to lower his instrument costs by at least 20%. And there is a lot of fun in the job which can be done in odd moments without cost.

You will be interested in our offer to ship any instrument for inspection upon receipt of 1/3 of the purchase price. Ask us about this and request our descriptive literature without delay.

STANDARD ASSEMBLING CO.

6 Stone St.,

New York, N. Y.

MOST COMPLETE RADIO STOCK IN DENVER

CLAPP-EASTHAM SET
GREBE RECEIVING SET
KENNEDY RECEIVING SET
MURDOCK EQUIPMENT

JEWELL METERS
ACME TRANSFORMERS
ESCO MOTOR GENERATORS
EBY BINDING POSTS

SEND 15¢ FOR OUR CATALOGUE—REFUND ON FIRST ORDER OF \$5 OR OVER

OPERATING KLZ and 9ZAF

REYNOLDS RADIO CO. Inc.
1524 GLENARM STREET

DENVER
COLORADO

Agent for the



DX RADIO FREQUENCY TRANSFORMER

Be up to date, use R.F. Amplification and coil aerial. The secret of long distance reception. We know it is superior, prove it for yourself. Free folder on principles of radio frequency amplification with pictorial diagram.

DX 1—170-450 meters \$8
DX S—400-1200 meters \$8
DX 2—900-3000 meters \$8
Plug-in socket mounting \$1

Remit with order.
Dealers Write

COLUMBIA RADIO
SUPPLY CO.
808 19th St., N. W.
Washington, D. C.



Everybody Wants a Radio Research Lapel Button

Worn by legitimate amateurs from coast to coast who have built their own sets. Artistic, high grade. No enamel to chip off. We carry in stock the above design in high quality gold plate \$1.00, solid gold, \$5.00. Radio clubs write for prices with club name or initials engraved in outer circle.

NEWARK JEWELERS' GUILD

Rose, cor. Kipp St., Newark, N. J.

Gold plated sample of Radio Research Lapel Button to show high quality sent to any Radio Club member or anyone about to organize a Radio Club, 50¢ postpaid.

WESTINGHOUSE

RADIO "A" and "B" BATTERIES



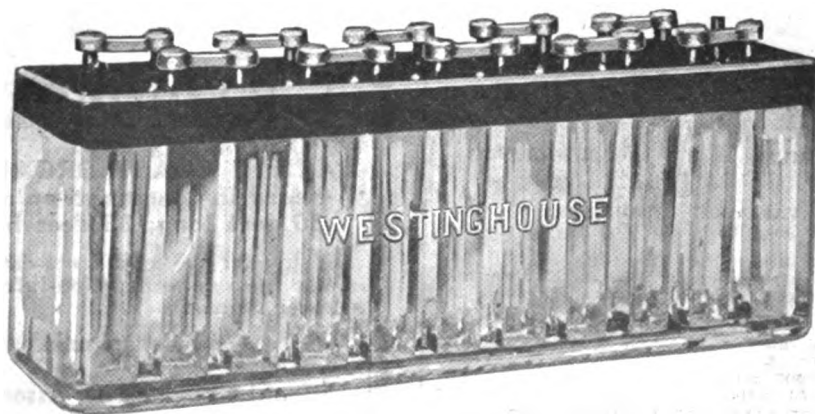
Westinghouse has a new Radio "B" Battery

that is a marvel for long, steady, dependable, noiseless service. Compactly built, with the 2-volt elements visibly arranged in a one-piece, eleven-compartment glass container. Lasts indefinitely; easily recharged. Get it from your radio dealer or the nearest Westinghouse Battery Service Station.

There are also two other types of Westinghouse "B" Batteries; and ten types of "A" Batteries, ranging from 27 to 162 ampere hours' capacity and in 4, 6 and 8 volts. There's a correct type for your set.

Westinghouse Union Battery Company
Swissvale, Pa.

"B" Battery
22-MG-2



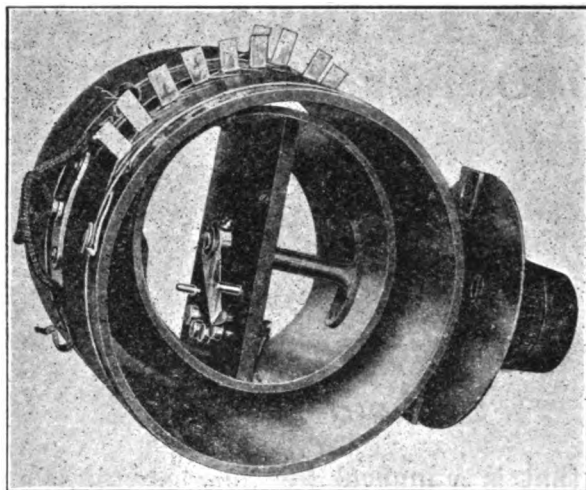
Built by Westinghouse—
you know it's right.

CLARION VARIOCOUPLER

NEW!

Note the
Adjustable
Secondary.

Tapped
Rotor Gives
Greater
Selectivity



NEW!

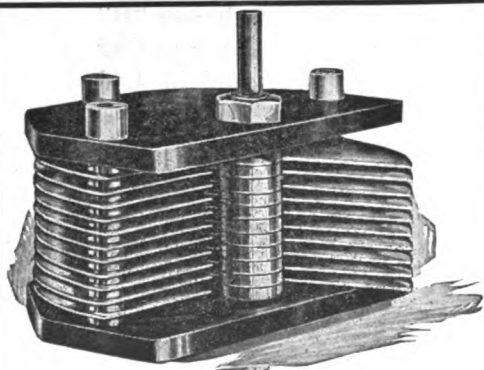
All the
Advantages
of the
Loose
Coupler
Price with
Dial \$8.00

PAT. APPLIED FOR

CLARION RADIO SHOP

347 Main St., Poughkeepsie, N. Y.

DEALERS WRITE OR WIRE FOR PROPOSITION



MAXIMUM



EFFICIENCY

VARIABLE CONDENSER

Accurately machined Front and Back End Plate Bearings.

Adjustable Rotor Shaft Thrust Bearing.

No Springs necessary for tension. No scratching noises. Perfect Electrical contact. Evenness unequalled.

PRICES

3 Plate Vernier	\$2.00
11 Plate .00025 mfd.	3.15
23 Plate .0005 mfd.	3.50
43 Plate .001 mfd.	4.50

THE HIGGY-AVERY CO.

1199-1205 Franklin Ave., Columbus, O.

If your Radio Dealer cannot furnish you with "MAXEFF" Condensers send us your order with remittance and we will supply you postpaid.

You May Listen

To distant broadcasting stations thru local interference if you use



RADIOVOX

PACIFIC COAST BROADCAST
heard in Cincinnati on antenna
30 feet long, 35 feet high.

You want the most up-to-date equipment. We have it; Non-Infringing—Clearer Signals.

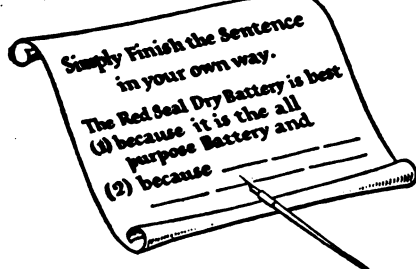
"Better Radio"

Scientific Engineering Association

817 Main St., Cincinnati, O.

Starts Nov. 1st Red Seal Battery Contest Closes Nov. 15th

For the Best Answer to THIS-



The Prizes

It is appropriate that the Manhattan Electrical Supply Company should be the first to offer such Radio Sets as these. This company was one of the pioneers in selling radio, as well as being the manufacturer of Red Seal Dry Batteries used so successfully in connection with radio sets.

First Prize—\$725.00

Complete Kennedy Radio Set

This Cabinet Type complete Radio Receiving Set is one of the finest and most up-to-date receiving sets yet produced. The cabinet is walnut and stands 58 inches high. Range from 400 to 600 miles for wireless telephone and 2,000 to 3,000 miles for wireless telegraph. Contained within the cabinet are all batteries, "Radio Homcharger de Luxe" battery charger and Magnavox loud speaker with special horn. Installed free in the home of the winner.

Second Prize—\$408.50

Complete Westinghouse Radio Set

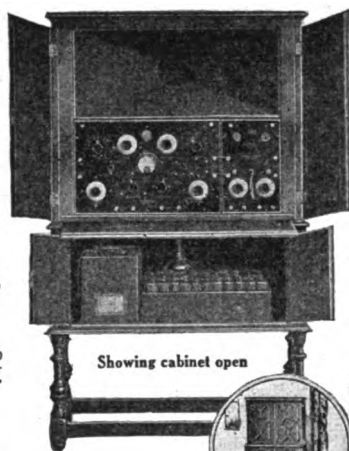
It consists of the Westinghouse R. C. Receiving Set and Western Electric Loud Speaker, "Tungar" Battery Charger, Storage Battery, "B" Batteries, Set of Manhattan 3,000 ohm Headphones, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

Third Prize—\$256.50 Complete Grebe Radio Set

A complete receiving outfit made up of the well known Grebe C. R.—9 Regenerative Receiver with Two

You Win THIS \$725.00 Complete Radio Set-Free

Hears broadcasted concerts 400 to 600 miles away; receives wireless telegraph from Europe, South America, from ships on the high seas, etc.



Showing cabinet open

Stage Amplifier, Magnavox Loud Speaker, Storage Battery, "Radio Homcharger de Luxe" battery charger "B" Batteries, set of Manhattan 2,000 ohm Headphones, 3 vacuum tubes, 2 telephone plugs and complete antenna equipment. Installed free in the home of the winner.

50 Other Prizes

To each of 50 other contestants whose answers are meritorious will be given one of the famous Manhattan 2,000 ohm Radio Headsets. These headsets have great sensitiveness and high amplifying qualities.

How to Enter the Contest

Simply follow the instructions on the Contest Blanks given away by stores all over the U. S. A. Nov. 1 to Nov. 15. You will recognize these stores by the Red Seal Window Display pictured below.



Look for this Window Display in Dealers' Windows Nov. 1 to Nov. 15. It identifies Dealers who will give you free Contest Entry Blanks.

The prizes will be awarded for the most appropriate answers completing in your own way, in not more than ten words the following sentence:

The Red Seal Dry Battery is best—

1. because it is the all-purpose battery, and
2. because.....

Important:—Only those answers written on the official Contest Blanks will be considered. Mail as many answers as you like to: Red Seal Battery Contest, Manhattan Electrical Supply Co., Inc., 17 Park Place, New York City.

The Judges

The winners will be selected by the following Judges: Mr. Llew Soule, Editor of "Hardware Age," New York; Mr. Howard A. Lewis, Manager of "Electrical Merchandising," New York, and Mr. Joseph A. Richards, President, Joseph Richards Co., Inc., Advertising Agents, New York.

Announcement of Winners

The names of the winners will be published in the *Saturday Evening Post* as soon as possible after the contest closes.

In case two or more persons submit winning answers, prizes identical in character with those offered will be given to each successful contestant.

Important to Dealers

Duplicates of these 53 prizes are to be given to dealers having the BEST CONTEST WINDOWS. Write us at once for full information and free window display material if you haven't already done so.



MANHATTAN
ELECTRICAL SUPPLY CO., INC. NEW YORK
Makers of the Famous Red Seal Dry Batteries and Manhattan Head Sets



ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS



MODEL RZ RADAK RECEIVING SET

Price \$100

Cabinets of world's finest woods, handsomely finished. Indestructible black metal dials. Hard rubber composition binding posts. Vernier variable type condensers. Antenna inductance wound on formica tube; plate inductance on moulded ball. Fan blade switch. Clapp-Eastham Type H400 Rheostat. Single circuit regenerative. Licensed under Armstrong U. S. Pat. 1,113,148.

THE POPULAR SET FOR CHRISTMAS GIVING

This will be a Radio Christmas. Thousands of homes will receive their first radio sets. In most of those homes no member of the family will be experienced in radio.

Model RZ Radak Receiving Set is designed to meet precisely this home need. Without technical knowledge or previous experience in radio, anyone can operate this set with astonishing results. Simple to install and even more simple to operate, Model RZ Radak receives and amplifies in one unit. Responds to wave lengths up to 8000 meters and increases the sound hundreds of times. With a loud speaker the volume of sound amazes even the hardened radio professional. Live electrical and radio dealers will feature Model RZ Radak Receiving Set for the holiday trade. If your regular dealer is not yet supplied write us for complete information regarding this and other Radak Sets ranging from \$40 up. Radio Equipment Catalog 6c.

Radak

Reg. U. S. Pat. Off.

Reliable Receiving Sets

CLAPP-EASTHAM COMPANY

105 Main Street, Cambridge, Mass.

America's Oldest, Largest Mfrs. of Radio Equipment Exclusively Established 1907



MILLION POINT MINERAL

The World's Greatest Radio Crystal

M. P. M. is revolutionizing radio. It is supersensitive and is the only crystal which reproduces from every point on its surface. Doubles your radius and greatly increases the audibility. Send 50¢ and the name of your Radio Dealer for two M. P. M. crystals, concert tested and guaranteed.

Dealers: Write today for complete information about M. P. M. and our attractive sales proposition.

M. P. M. SALES COMPANY

Dept. Q. 247 So. Central Los Angeles, Cal.

SPECIALS

MURDOCK PHONES No. 56

2000 OHM\$3.98

3000 OHM\$4.98

Variometers & Variocouplers

Best Grade Guaranteed

VARIOMETERS LESS DIAL....\$3.98

VARIOCOUPLER LESS DIAL...\$3.98

Add 60¢ for 3" Dial

Mailing Charges on Each Item 10¢. Send Your Order At Once As There Is Only a Limited Supply Left.

THE RADIO SHOP

BOX 2124

New Brunswick, N. J.

SAVE YOUR BATTERY SAVE YOUR RUGS SAVE YOUR TEMPER SAVE YOUR TIME

With the CHASLYN Ball Battery Testing Set you can "read" the exact condition of the acid in your battery instantly by noting which balls sink. No scale to read.

Depth gauge shows how well plates are covered.

Air-control Stopper facilitates adding distilled water.

If your dealer does not have the Chaslyn Set, send \$1.00 and his name and address. Set will be sent postpaid.

THE CHASLYN CO.
4317 Kenmore Ave.,
Chicago, Ill.



At Last! *The Perfect* Radio Loud Speaker *for the Home*

THERE is no other Loud Speaker like the DICTOGRAPH—made expressly for home use by the makers of world-famous Dictograph products—standard everywhere for the finest, most accurate and most sensitive sound-transmission and loud-speaking devices. No other organization in existence has the facilities, the skill, the experience of the Dictograph Products Corporation for producing a perfect Loud Speaker.

DICTOGRAPH Radio LOUD SPEAKER

Years of experience in producing the marvelously sensitive "Acousticon" for the Deaf, the Detective Dictograph and the Dictograph System of Loud-Speaking Telephones have made possible this wonderful Radio Loud Speaker that reproduces every sound—singing, speaking, instrumental music—in crystal-clear, natural tones, full volume, and **FREE FROM DISTORTION AND NOISE.**

The Dictograph Radio Loud Speaker gives perfect results with any vacuum tube receiving set. No alterations; no extra batteries—you simply plug in and listen. The handsome appearance of this quality instrument harmonizes with any home.

Ask for a **FREE DEMONSTRATION** of the Dictograph Radio Loud Speaker at any reliable radio shop. Get DICTOGRAPH quality and still save money.

Dealers: Order through your jobber or write for names of authorized distributors.

DICTOGRAPH PRODUCTS CORPORATION

200 West 42d Street,

Branches in all principal cities

New York City



Price
\$20

Complete with 5 ft. flexible cord.
A beautiful instrument! Finely constructed, richly finished. Its handsome appearance harmonizes with any home. Highly burnished, French lacquered, eleven inch spun copper bell horn attached to die cast black enamel tone arm, finished with nickel trimmings. Cabinet 6 x 5 inches base, 4 inches high, of solid, ebony-finished hardwood, mounted upon rubber knobs. Furnished complete with 5 ft. flexible cord. No extra batteries required.



DICTOGRAPH Radio HEAD SET

The Best Head Set at any Price

The Dictograph Radio Head Set has established a standard of quality impossible to secure in any other headset. Its use on any receiving set, crystal detector or vacuum tube, improves reception immeasurably.

3000 ohms resistance. The best Head Set in the world. Regularly furnished as Standard Equipment with the Leading Receiving Sets made.

Announcing ---

The New "All-American" Audio Frequency Transformers

(COMPLETELY SHIELDED)

Amplification-the Soul of Radio

However perfect your set may be, the least fault in your Radio or Audio Amplification takes the heart and soul out of your receiving set.

"All-American" Transformers

Perfected, first, from the stand-point of *correct* engineering, by proper turns ratio, impedance and shielding—then, in our latest models, given the finishing touches of outward beauty that the more critical eye demanded. The shielding is a highly polished, heavily nickeled brass case.

The new R-21, Ratio 5 to 1, has an amplification constant approximately equal to that of our R-18 (10 to 1) but can be used on as high as three stages without distortion or howling.

Send for bulletin No. 22, showing successful Radio and Audio Frequency hook-ups. Your dealer has "All American" Transformers.



Type R-12
Ratio 3-1

\$4.50

Type R-13
Ratio 10-1
and

Type R-21
Ratio 5-1

\$4.75



RAULAND MFG. CO.
35 So. Dearborn St., Chicago, Ill.



New Prices on Elwood Headsets

2000 Ohms \$5.50

3000 Ohms \$6.50

The lowered prices quoted above reflect the established Elwood policy of giving the dealer and the consumer the benefit of lower manufacturing costs as fast as they are justified.

Seventeen years manufacturing experience—a thoroughly equipped and old established plant—a personnel committed to sound engineering practice—these are the factors behind Elwood Radio Products.

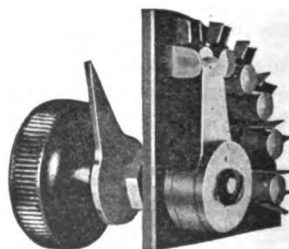
Headsets — Binding Posts — Loud Speakers — Tube Sockets — Filament Rheostats—Audio Frequency Transformers — Radio Frequency Transformers.

Elwood Radio Products

ELWOOD ELECTRIC CO. INC.

2-4 Randall Ave., Bridgeport, Ct.

WIS - WIN SWITCHES



#756—6 point inductance switch \$1.25 postpaid. Add 5c for each additional point.

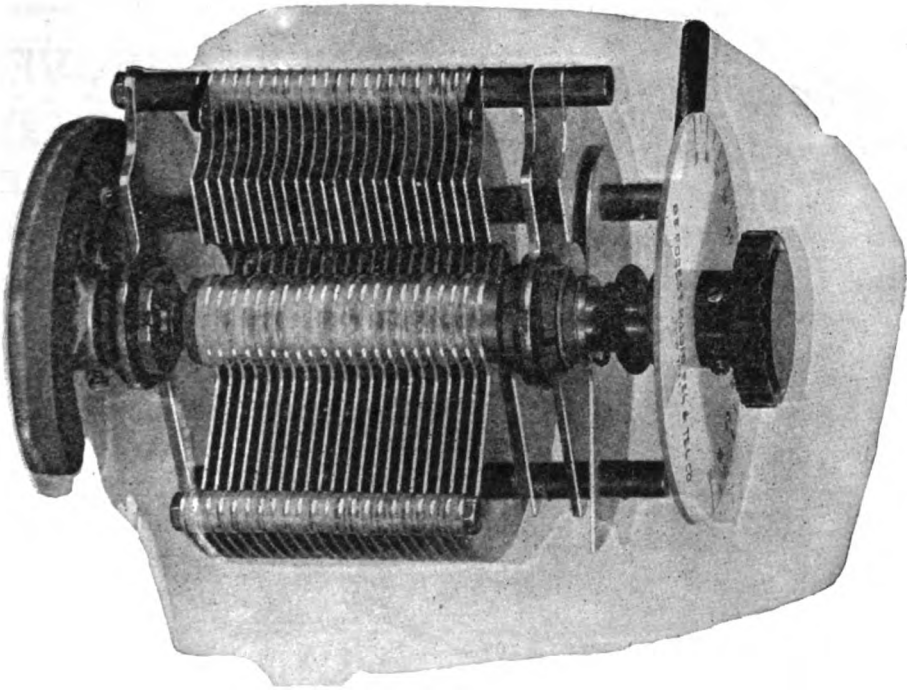
Drill only one hole in panel to mount complete switch and contacts. We make switches for all uses. Circular S-1 free on request.

Dealers write for proposition.

Willis Switch & Instrument Co.

8 Kingsbury St.,

Jamestown, N. Y.



THANKS FOR YOUR PATIENCE!

THE radio public was very patient when we were unable to supply De Forest Vernier Condensers, because they knew that all we could make were going into the famous De Forest MR-6 Receiving Sets.

Now, however, you can have the satisfaction of putting genuine De Forest Condensers on that special set you are building. The CV-1003 and CV-1503 Vernier Condensers are now again available. Production has been increased as fast as was possible—always remembering the maintenance of De Forest quality.

It is only necessary to remind you of some of the reasons why these Condensers have

been declared perfection by radio experts. The movable plates are heavier than those in any other. The separately controlled Vernier plate gets you "in on the peak" and gives you 20% louder signals. The securely fastened counter weight acts as a balance and permits smooth, accurate operation in any position. Each Condenser is individually tested at 500 volts. The whole construction is a fine example of scientific precision laboratory equipment.

Used with De Forest Honeycomb Duo-Lateral Coils, these Condensers provide tuning equipment unsurpassed for selectivity, sharpness, and all-round efficiency.

DE FOREST RADIO TEL. & TEL. CO., JERSEY CITY, N. J.

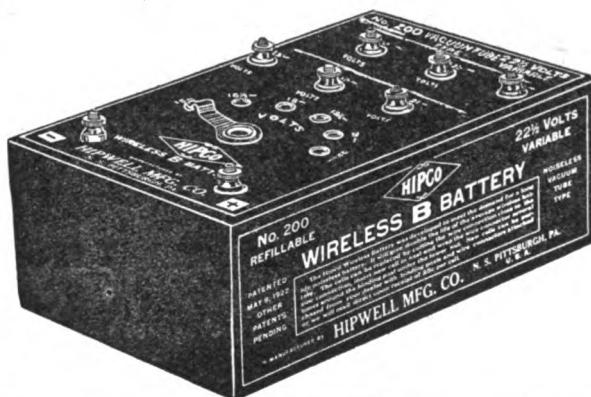




PRICE \$3.50

**THE NEW IMPROVED
WIRELESS B BATTERY
REFILLABLE VARIABLE
NOISELESS IN OPERATION**

The Switch Makes It 100 p.c. Perfect



Must be seen to be appreciated. It has all the features that made last year's B Battery the phenomenal success. Ask for catalogue describing our full line of B Batteries and other Radio Supplies.

For sale at all radio supply dealers.

**HIPWELL MFG. CO
N. S. PITTSBURGH, PA.**

ARE YOU PREPARED?

We can supply you with anything on the market for that C.W. set you are going to use.

C us about CW

Catalog 5c

Anthracite Radio Shop

P. O. Box 3 Scranton, Penna

Buy Your Radio Receiving Set at Manufacturers' Cost

Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.

KING RADIO MFG. CO.

521 Penn Ave., Wilksburg, Pa.



Na-ald De Luxe V. T. Socket

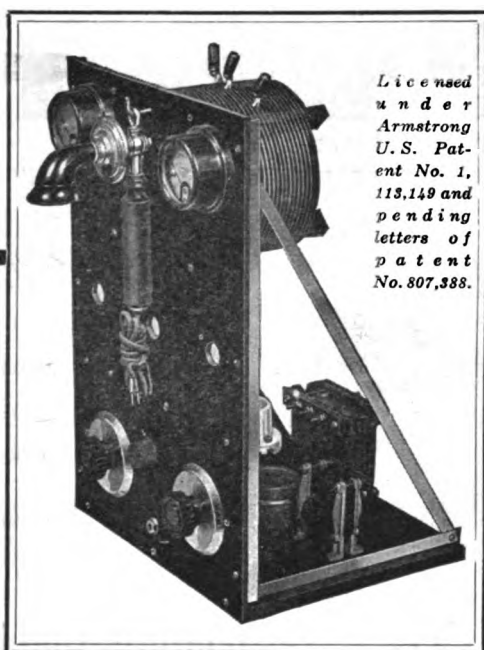
Contact strips of laminated Phosphor bronze press firmly against contact pins, regardless of variation in length. No open current trouble possible.

Socket moulded from genuine Condensite. Practically unbreakable. Special protected slot, with exterior reinforcement. Unaffected by heat of bulbs or soldering iron. All excess metal eliminated, aiding reception. May be used for 5 Watt power tube. Highest quality throughout. Price 75¢.

Special proposition to dealers and jobbers.

ALDEN-NAPIER CO.

Dept. M.
52 Willow St., SPRINGFIELD, MASS.



Licensed
under
Armstrong
U. S. Pat-
ent No. 1,
113,149 and
pending
letters of
patent
No. 807,388.

The BENWOOD CW Transmitter

*Simple, compact, up-to-the-minute
construction-incorporating all the
improvements made possible by our
years of experimenting and it
gets results!*

1500 Miles With CW! 1100 Miles Voice!

**Music Heard 40 Feet From Phones by
Stations in 300 to 400 Mile Radius**

THESE are actual results obtained by our testing station WEB, using the Benwood CW Transmitter shown herewith. You can get just as good results with it. This high-class set is just the thing for your broadcasting and DX work—using CW, ICW, Modulated Buzzer or Voice Transmission. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union. It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design.

Radiates $1\frac{1}{2}$ to 3 Amps on Average Antenna

We guarantee that this outfit will radiate $1\frac{1}{2}$ amperes on the average amateur antenna. It will radiate 2 to 3 amperes when used with an antenna whose fundamental wave length is 225 to 275 meters. That is why you can get such wonderful results.

The set comes to you completely assembled with all parts mounted on panel, as shown, and completely wired. You can start sending as soon as you attach to suitable antenna and ground connections and insert tubes. The outfit is complete with motor generator minus tubes, and consists of the following: Panel $12 \times 18 \times \frac{3}{4}$, angle supports, hardwood base, 3 tube sockets, 1 power rheostat, 1 80-watt filament trans., 1 modulation trans., 1 CW inductance, 1 hand transmitter, 1 0-3 Radiation meter, 1 0-500 milliammeter, 1 21-plate condenser, 1 43-plate condenser, 1 tapped condenser, 1 L300 choke coil, 1 2000-volt filter condenser, 1 10,000 ohm grid leak, plug and jack connection for microphone buzzer and C.W., 1 600-volt 220 watt motor-generator. Completely wired and boxed for shipment, \$350.00 f. o. b. St. Louis, Mo.

CATALOG: Send 10¢ in stamps for the Benwood catalog and price list, also complete catalog and price list of DeForest radio equipment.

DEALERS: We manufacture a complete line of radio apparatus and have stock on hand ready to ship. Write or wire for our attractive proposition. New price list just issued.

The **BENWOOD** Co. INC.
RADIO
"WORLD-WIDE MAIL ORDER SERVICE"
1114 OLIVE STREET ST. LOUIS, MO.

POSACO

RADIO

QUALITY AND EFFICIENCY

VERNIER CONDENSER WITH SINGLE KNOB CONTROL

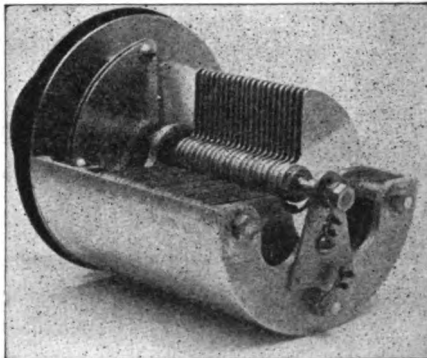
Especially Adapted to the New Armstrong Super - Regenerative Circuits in which Variable Condensers Play an Important Part and in which fine adjustments are Absolutely Essential.

B-1 .001015 MFD.
\$7.50

B-2 .000545 MFD.
\$7.00

B-3 .000295 MFD.
\$6.50

Constructed With the Same High Standard of Quality in Materials, Workmanship and Design As Our Regular Variable.



NEW MODEL. Improved Construction and Design. Gives Maximum Rigidity, Thus Insuring Permanence of Alignment and High Efficiency in Operation.

A-1 .001 MFD.
\$4.50

A-2 .0005 MFD.
\$4.00

A-3 .00025 MFD.
\$3.50

A-4 .000045 MFD.
\$3.00

Ask Your Dealer or Write for Circular. Jobbers and Dealers Write for Proposition Increase Your Sales

—MANUFACTURED BY— Alden L. McMurtry, Licensee

THE C. D. POTTER CO.,

Stamford, Connecticut

POSACO

RADIO

PANEL SERVICE

We offer to the amateur and dealer

REAL PANEL SERVICE.

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8" per square inch \$0.02

3/16" per square inch .02 1/2

1/4" per square inch .03

We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

PITTSBURGH RADIO

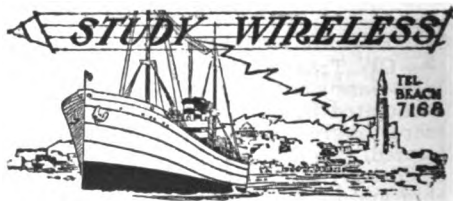
AND

APPLIANCE CO., Inc.

"Pittsburgh's Radio Shop"

Desk B

112 Diamond St., Pittsburgh, Pa.



RADIO SCHOOL

Send at once, if you are interested in obtaining a license for our FREE catalog explaining how and why, during the last two years, we have graduated and placed more licensed operators than any other school in New England.

MASSACHUSETTS RADIO and
TELEGRAPH SCHOOL, Inc.

18 Beylston St. Boston, Mass.

Formerly Boston School of Telegraphy, Est. 1903

G. R. ENTWISTLE, Radio Director



ACT 4 OPERA CARMEN

LEADERS use the accepted rules and precedents, by which the majority bind their efforts, only as starting points for higher achievements. Mu-Rad Apparatus, embodying new principles, is the achievement of such a group of leading radio engineers. The very moderate prices of this apparatus make the accomplishment the more noteworthy. Bulletin upon request.



MU-RAD
LABORATORIES
INCORPORATED
ASBURY PARK
NEW JERSEY



The New
 Star in
 the Radio
 World



TELMACOPHONE

The Metal Horn without the metallic sound



Jobbers and Dealers.
We are also distributors for several manufacturers of Quality Radio Apparatus. Write for our catalog.

**Correctly Designed, Fairly Priced
Unreservedly Guaranteed**

The Quality has been improved and the production increased but the price remains the same.

**With Baldwin Type C. Unit
Price Complete \$20.00**

Radio Division

TELEPHONE MAINTENANCE CO.

20 S. Wells Street,

Dept. D.

Chicago, Illinois

THE RADIO AMATEUR IS DESERVING OF THE LOYAL SUPPORT OF EVERYONE!

THE REAL AMATEUR KNOWS RADIO MATERIALS, AND HE ALSO KNOWS THAT THE OLD TIME MANUFACTURERS WITH THEIR YEARS OF EXPERIENCE & EXPERIMENTING HAVE ALWAYS HAD THE GOOD OF THE AMATEUR AT HEART. THE AMATEUR IS AGAIN COMING INTO HIS OWN AND HE IS GOING TO BUY MATERIALS MADE BY THE OLD TIME RADIO MAKERS.

THE DETROIT ELECTRIC CO., LONG KNOWN AS ONE OF THE BIGGEST JOBBERS & DEALERS IN THE COUNTRY CARRY IN STOCK FOR IMMEDIATE DELIVERY ALL THE BETTER CLASS OF RADIO MATERIALS. TRANSMITTING EQUIPMENT IS OUR SPECIALTY.

WE WANT EVERY AMATEUR & DEALER TO HAVE OUR CATALOG NO. 10. OVER ONE HUNDRED ILLUSTRATIONS.

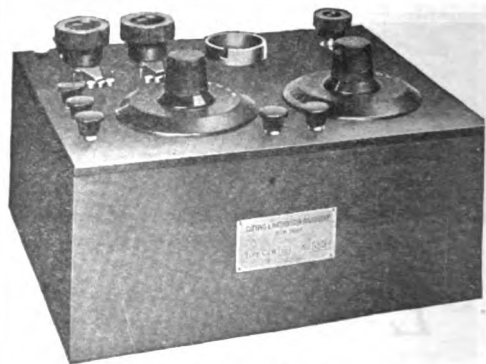
MAIL ORDERS FILLED SAME DAY.

Detroit Electric Company

113-115 East Jefferson Av.

Detroit, Michigan

Est. 1883



Type C & W No. 12

Manufactured By

The Cutting & Washington Radio Corp.

An ideal receiver for telephone, C.W. and spark reception.

Descriptive literature sent on request.

We handle a complete line of parts and equipment, May we serve you?

"NEW RAD"

The mark of satisfaction.

The New York Radio Laboratories

Manufacturers, Jobbers and Dealers

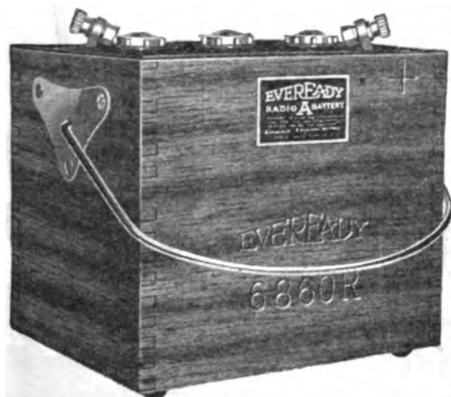
Dept. C. BINGHAMTON, N. Y.

FOR BETTER RESULTS

USE

EVEREADY

"A" and "B" BATTERIES



EVEREADY "A" BATTERIES

- hardwood box, mahogany finish
 - convenient handle, nickel plated
 - rubber feet protect the table
 - insulated top prevents short circuits
 - Packed vent caps prevent spilling
- No. 6860—90 Amp. Hrs.—45
Lbs. \$18.00
- No. 6880—110 Amp. Hrs.—
52 Lbs. \$20.00

EVEREADY "B" BATTERIES

No. 766 is the most popular size in use. Contains 15 cells and has a long service life. Equipped with five positive Fahnestock Spring Clip Binding Posts ranging from 16½ to 22½ volts, making it the most desirable type for use with vacuum detector tubes, such as Radiotron, Model UV-200. Dimensions:—Length, 6⅝"; width, 4"; height, 3". Weight, 3 lbs. 7oz. Price, \$3.00



EVEREADY "B" BATTERIES can also be obtained in the following types:

No. 763

Especially suitable for use where light weight or small space is essential, such as in small portable sets. Contains 15 cells, enclosed in waterproof cardboard box, equipped with two coil wire leads. Initial voltage of 22½ volts. Dimensions:—Length, 3⅝"; width, 2"; height, 2¼". Weight, 13 oz.

Price, \$1.75

No. 767

Contains 30 cells of the same size as in No. 766 and is therefore approximately twice the dimensions. It has the same voltage taps as the No. 766 and in addition has a 45-volt tap; all Fahnestock Spring Clip connections. The lower range of voltage taps is to be used in connection with the detector tube, and the 45-volt tap for the amplifier tubes.

Price, \$5.50

No. 746

Consists of 72 cells equipped with two coil wire leads enclosed in a wooden box, made airtight. It gives 108 volts and is most widely used in conjunction with loud speaking devices, such as the Magnavox. It is especially suitable for theater and auditorium use, or outdoors, where the message must be carried to the longest distance required. Dimensions:—Length, 17"; width, 9"; height, 3½". Weight, 20 lbs.

Price, \$15.00

Send today for Descriptive Booklets

NATIONAL CARBON COMPANY, Inc.

Long Island City, N. Y.

Atlanta

Chicago

Cleveland

Kansas City

Warren Head Sets

2000 Ohms \$7
3000 Ohms \$9



Specialists in Head Sets
and Loud Speakers

—thoroughly tested
and each pair of
phones toned alike to
the finest degree of accuracy.

The solid aluminum case,
hard rubber cap and highly
nickel-plated finish assure
long, faithful service.

Every WARREN
Head Set is
covered by an
iron-clad, money-
back guarantee.

*The supreme achieve-
ment of a Master
Designer of
Receivers.*

Ask your Jobber—
or write us

WARREN RADIO PHONE MFG. CO. Inc.
WARREN, RHODE ISLAND, U.S.A.



DONGAN

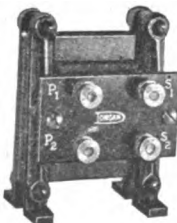
RADIO FREQUENCY TRANSFORMERS

are unexcelled for radio frequency amplification. The adjustable silicon core, (a patented feature) enables accurate tuning of the grid and plate circuit to the frequency of the incoming signals.—Without an equal from 200 to 400 meter reception."

DONGAN

AMPLIFYING TRANSFORMERS

embody the DONGAN standard of high grade workmanship throughout. Scientifically constructed.—Reasonable in price—Neat in appearance. Manufactured in ratios of 6-1 and 3½-1.



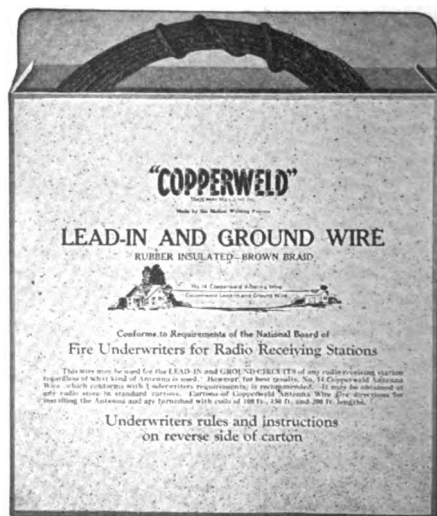
Manufactured By

DONGAN ELECTRIC MFG. COMPANY
2983-2993 Franklin St.
DETROIT, MICH.

—Western Distributors—
SIERRA ELECTRIC COMPANY

301-304 Roberts Bldg., Los Angeles, Calif.
515 Market St., San Francisco, Calif.

BUY IT IN CARTONS



HAS THE UNDERWRITERS' O. K.

A WESTON FILAMENT VOLTMETER-- *WHY?*

Because a Weston Voltmeter costs but little more than ONE Vacuum Tube—and its proper use will save not only that tube from prematurely burning out, but all others you subsequently buy. Its use will double and treble the life of every tube.

Because with a Weston Voltmeter you can always duplicate instantly any voltage required for best results—and your exact tuning is thereafter a simple matter. For accelerated tuning and good reception it is therefore an absolute necessity on every receiving set.

Why not make this money-saving investment right now—before you lose another tube?

Circular J describes this voltmeter fully and also tells you of other important Weston instruments for Radio use. Write for it.



*"The
Watch
Dog
of the
TUBE"*

*One of several important
Weston instruments im-
proving Radio Reception
and Transmission.*

Weston Electrical Instrument Co.

158 Weston Ave.,

Newark, N. J.

Makers of Electrical Instruments since 1888

WESTON



"STANDARD" The World Over
**ELECTRICAL
INSTRUMENTS**

*An Indicating
Instrument for
Every Individual
Need and Industrial
Purpose*

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

129

Interference Eliminated to the Nth Degree

"The Ear of the World"

TRADE MARK

*Bitter Root Valley,
in the Heart of the Rockies,
Listens to Pittsburgh,
1,500 Miles Away*



ZENITH

Long Distance Radio

Licensed and Manufactured under Armstrong
U. S. Patent No. 1,113,149 and U. S. Applica-
tion No. 807,388.

Model 1-R

A complete three-circuit regenera-
tive feed-back tuner, using the
"Armstrong Regenerative Circuit,"
combined with an audion detector.
Radically different in construction
and accomplishing the following
results:

Total elimination of all body capaci-
ty by proper concentration of the
electro-static and electro-magnetic
fields *without* the use of metal
shields or screens.

Reduction of high frequency re-
sistance to an absolute minimum,
and consequent increase in signal
strength and efficiency.

Unusual selectivity and extreme
distance range—achieved by radi-
cal departure from customary
methods of construction. Artistic
beauty and refinement as well as
efficiency are outstanding features
of the ZENITH.

Price \$75.00

**Sold Through
Music Dealers Exclusively**

Chicago Radio Laboratory
McCormick Building Chicago, Illinois

The outstanding feature of the Zenith Long
Distance Radio is its **selectivity**.

Not only does the Zenith put you in touch with
all important broadcasting stations within a radius
of 1,500 miles, but whether the station be near or
far, the "voices of the air" come to you through
the Zenith "as loud and clear as a good red-seal
record." —To all of which the following letter
from a Zenith fan in Stevensville, Montana, bears
enthusiastic witness:

Stevensville, Montana,
Sept. 21, 1922.

Chicago Radio Laboratory.
Chicago, Illinois.
Gentlemen:

I believe I am going to give you some facts that will
astonish even the makers of the wonderful 1-R ZENITH—
and please remember that this station is in the Bitter Root
Valley, completely surrounded by high mountains.

With my Zenith equipment I have twice picked up
KDKA, Pittsburgh, 1,500 miles as the crow flies. Stations
received between 7:00 and 12:00 P. M. on the evening of
September 12th:

DN4	Colorado National Guard, Denver
KWG	Portland Wireless Telephone Co., Stockton, Cal.
KGG	Hallock & Watson Radio Service, Portland
KFBB	Havre, Montana
KSD	St. Louis Post-Dispatch
CHBC	Calgary, Canada
KZN	Deseret News, Salt Lake City
WOI	Iowa State College, Ames, Ia.
KGB	Tacoma, Washington
KYG	Portland, Oregon
KDZR	Bellingham, Wash.
KFD	Seattle Post-Intelligencer

These results were obtained on my 80-foot aerial. I
used two stages of amplification; and sending the music
through the Victrola with Zenith phonograph adapter, it
was as loud and clear as a good red-seal record.

Above tests were made in the presence of three persons.
I can substantiate the above and duplicate the tests before
any number of reliable witnesses.

(Signed) ASHLEY C. DIXON.

You will never really know what "Radio" is capable of
doing until you listen to a Zenith. Let us give you that
opportunity. Simply send us the name of your nearest
music dealer, and we will either arrange a demonstration at
his store or write you promptly where such demonstration
may be had. There is no obligation. Write TODAY.

Attention—ARRL Members —This Page is YOURS

ASST OPNS
C. J. MATTHEWS—CF
W. J. MATTHEWS—W
J. CALLEMAN—JA
B. HANSEN—W

R. H. G. MATTHEWS Chief Opn WO

Radio 9ZN

CHICAGO ILL

November 1927

Follow ARRL Men—

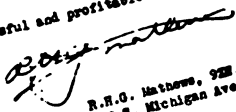
I have received so many replies to our broadcasts of October 1st to 5th from 9ZN in regard to the connecting up of our members with various music dealers throughout the country handling radio, and the financial profit has been so great to those with whom I have been able to place, that I think it well worth while to place this message before our entire membership through the medium of our official organ, QST.

For years we ARRL men have been doing various kinds of radio work without profit of any kind. We can now make money in the line in which we are all most interested, and thus make our pleasure profitable. Some of the men who have hooked up with radio-music dealers are making \$5,000.00 a year or more, and there are many more real positions to be had by our members. Music dealers throughout the United States are either handling or contemplating the handling of high grade radio for home entertainment. They are the logical dealers for this type of apparatus having plenty of finances, good business connections, and excellent show rooms, but naturally do not know how to operate the radio business.

No matter how isolated your home is there is a music dealer in your vicinity who wants and needs you in connection with his radio business. The opportunities for excellent positions are unlimited.

A number of our old timers such as Clayton, 6SL, of Little Rock, and Quinn, 9SL, of Keosauh, Wisconsin, are already occupying such positions, and I will be more than glad to furnish full details as to how these connections can be made to any of our members who read this and are interested.

Yours for a successful and profitable connection,


 R.H.G. Matthews, 9ZN.
 332 S. Michigan Ave.

Make Your Pleasure PROFITABLE



Trade Mark
Registered

GREBE distributors in Eastern Pennsylvania, Southern New Jersey, Delaware and Maryland. The Famous Grebe Receivers are renowned for their sensitivity and expert workmanship.

We carry complete stocks of R. C. A. Products and others of merit.

Have your dealer order from us for immediate Shipment.

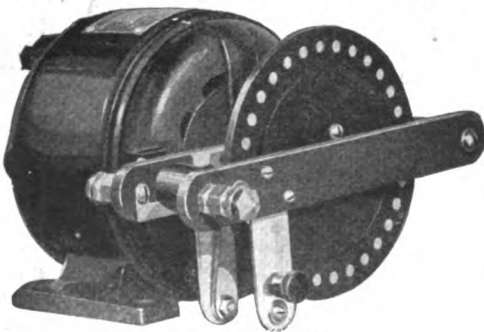
PHILADELPHIA WIRELESS SALES CORPORATION

Formerly Philadelphia School of Wireless Telegraphy

1533 PINE STREET

PHILADELPHIA, PA.

The New Robertson-Detroit Chopper



Patent applied for.

Most beautiful radio instrument ever put on the market.

Mechanically and electrically perfect. Wheel and frame of Bakelite and brass. Wheel 5 in. diameter; 30 large inserts; 1800 RPM. Fine clear Note.

Motor: Westinghouse 1/12 H.P. Either A.C. or D.C.

These Choppers now in use from Coast to Coast.

See our adv. in October QST. Price f.o.b. Detroit \$35.00. Shipping weight, 20 lbs.

Announcement of our Synchronous Rectifier soon.

Dealers please write for terms.

Robertson Clock & Instrument Co.
409 East Congress St., Detroit, Mich.

Leich Radio Head Phones

TIME
Accurate
Reception
Bakelite

Cap
Inside
Terminals
Weight
11 oz.



TESTED
Protected
Adjustment
Unbreak-
able Shell
Comfort-
able
Head Band

Made from the best of materials.

A Quality product at an Honest Price

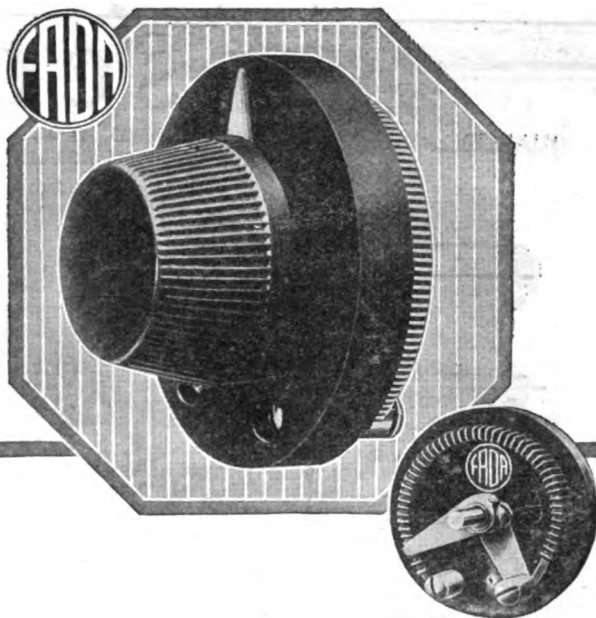
2000 Ohm—\$7.50

3000 Ohm—\$10.00

LEICH ELECTRIC CO.

Genoa, Illinois

A
Better Rheostat
for 75 Cents



New Grade hard fibre—
 Will not absorb moisture
 and corrode wires.



Half Million "Radio Fans"
Bought Fada Rheostats in 1921

An unquestionable attribute to the merit of Fada rheostats is the universal approval of over half a million satisfied users.

As a parallel to this achievement, Fada announces a new rheostat—a better instrument for less money. This new Fada rheostat, using a special hard fibre resistor strip, represents the peak in rheostat design and finish.

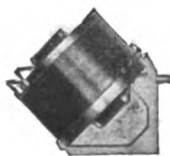
This new fibre strip is specially treated and will not absorb moisture and corrode the wires. A notable advance in rheostat manufacture.

The new Fada rheostat, as a whole, is designed for use by those experts who love to construct and who take great interest in appearance and efficiency of their set.

FRANK A. D. ANDREA

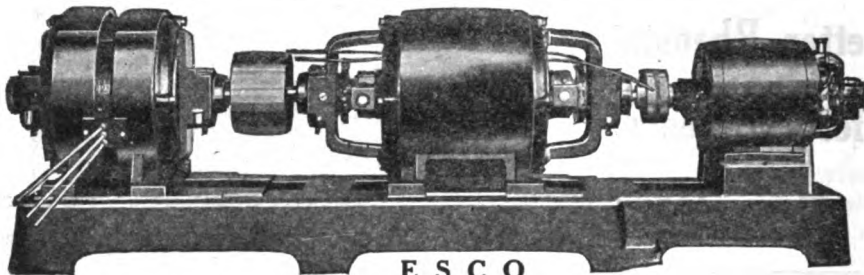
1581-E Jerome Ave.,
 \$1.00 \$4.75

New York City
 \$27.00



TRADE **ESCO** MARK

QUALITY ALWAYS HAS BEEN, AND ALWAYS WILL BE, THE WORLD'S SAFEST INVESTMENT



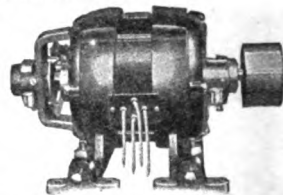
ESCO

HIGH VOLTAGE MOTOR-GENERATORS STAND PRE-EMINENT
Used by Leading Educational Institutions, U. S. Army and Navy Academies, Research Laboratories,
Newspapers, Dept. Stores and Broadcasting Stations.
BULLETIN 237 LISTS OVER 200 COMBINATIONS
Special Apparatus Developed for Special Requirements
MOTORS—DYNAMOTORS—GENERATORS—MOTOR-GENERATORS

Sold by Principal Dealers Everywhere



Electric Specialty Co.
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WHAT IS IT?

Every one in any way connected with **RADIO** is vitally affected by this, most important of all in the distribution of Radio Apparatus.

WHAT IS IT?

It is real **SERVICE**

Service is only made possible by a large complete stock and efficient capable radio engineers in charge.

We have just been appointed distributors for

Clapp-Eastham



VIRGINIA RADIO CORPORATION
CHARLOTTESVILLE, VA.

RHAMSTINE* RADIO FREQUENCY TRANSFORMER



\$4.50

Complete with
mounting

Rhamstine* has produced in this transformer every quality which you would naturally look for. In efficiency it is comparable with others costing much more and in design and finish it is doubtful if you can find its equal. Each transformer is equipped with a base mounting and sold at a price exceptionally low as compared with the high value of the unit.

Type 1, 200-500 meters, especially efficient for the present broadcasting services.
Immediate deliveries.

MANUFACTURED BY

J. THOS. RHAMSTINE*
2152 E. Larned St., Detroit, Mich.
*Maker of Radio Products

EISEMANN

IN selecting parts for a receiving set, the amateur should give consideration to appearance of parts when mounted. The unique design of Eisemann control bar and dial is exceptionally distinctive.



Variometer

Stator and Rotor molded Bakelite. Forms extremely light in weight. New type of Bar control. No protruding knobs and dials.

Price each \$8.75

Control bars and dials are flush with panel and permit of accurate adjustments.

In every instance, provision has been made for simple form of mounting.

The prices are extremely reasonable, commensurate with highest quality of workmanship and material.

The reputation and financial responsibility of the corporation is assurance of unqualified guarantees.

Each unit has been designed unhurriedly and embraces the most advanced development in Radio Engineering.

All new units must meet the most exacting and rigid tests in our Research Laboratories before release by our engineers.

Insist on Eisemann products. Accept no "Just As Good" substitutes. If your Dealer cannot supply you, write us.



Variocoupler

Complete in every detail: no external switches, shielding, dial or knob necessary. Molded Bakelite forms. Insulated within itself.

Price each \$10.50



Head Phones

The Eisemann Head Phone will faithfully reproduce all broadcasted musical and spoken sounds. It is of simple design, yet rugged and sturdy of construction. The set is unequalled for quality of tone and balance of the receivers.

Price complete—\$8.00



Audio Frequency Amplifying Transformer

Maximum amplification within the tube limits is made possible and distortion of the signal is eliminated. Ratio nine to one.

Price each \$6.00

Send for Descriptive Folders

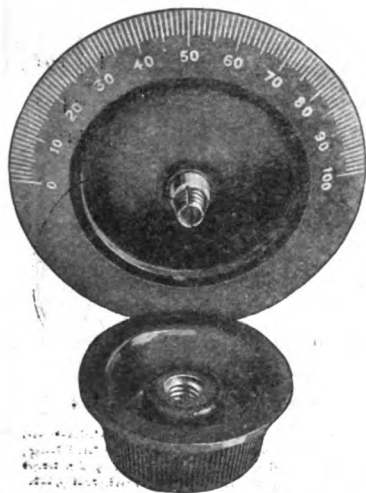
EISEMANN MAGNETO CORPORATION

William N. Shaw, President

DETROIT

32 - 33rd Street, Brooklyn, N. Y.

CHICAGO



Patented June 20, 1922

The Only Knob and Dial Without a Set-screw

The unsightly and troublesome SET-SCREW is at last eliminated. No more splitting the head of the set-screw or stripping of threads, perhaps ruining the dial.

To mount the TAIT-KNOB-AND-DIAL simply hold the dial with one hand and screw on the knob with the other; a few seconds does it. No tools are necessary. When fastened it is self centering and self aligning.

This beautiful patterned KNOB-AND-DIAL is made of the best grade of Bakelite.

To those building their own sets—Don't fail to use this dial, it is REVOLUTIONARY in its field and is the PEER of all KNOBS-AND-DIALS. If your dealer has none write

us, and we will refer you to one who has.

Dealers—If your Jobber is not stocked up write us and we will refer you likewise.

Price—3"\$1.00
Price—4"\$1.50

*We Sell Strictly to Manufacturers
and Jobbers—whom we invite to
write us for samples and discounts.*

TAIT KNOB & DIAL COMPANY

Incorporated

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Phone Murray Hill 0341

GLOBE PRODUCTS

Are known the world over

The Globe name on any Radio product is your guarantee of high quality.

Globe Radio Head Phones



Highly sensitive,
Hard rubber caps,
Matched receivers,
Natural in tone,
Each receiver test-
ed by Radio,
Will not distort sig-
nals when amplified,
Articulation perfect.

2,200 Ohms—\$8.00

behind all Globe products, which include the Vactu-
phone, the only hearing instrument for the deaf,
using the vacuum tube amplifier, the Globe Geo-
phone and the Globe Secret Phone.

Increased production has enabled us to reduce costs
—We give you the benefit. Note new price \$8.00.
Until you use the Globe headset you cannot know
the real pleasure of Radio.

Globe phones are for those who want the best.

GLOBE ANTENNA ATTACHMENT PLUG

Price \$2.50

Insist upon getting the Globe. If your dealer can-
not supply you, write us giving name of dealer.

GLOBE PHONE MFG. COMPANY

Reading, Mass., U. S. A.

DEALERS

Are you ready for the holiday trade? Are
your connections of such a nature that you
can depend on RUSH ORDERS being put
through on time? We can guarantee
prompt delivery, and our discounts are
most liberal.

We Are Jobbers For

Grebe Receiving Sets

Murdock Products

Baldwin Phones

Federal, Fada and

Radio Shop Products

Write for Our Special Proposition "Z"

THE RADIO SHOP

—of Newark—

41 S. Orange Ave.

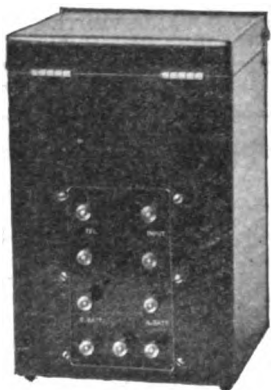
NEWARK, N. J.



Junior Detector Units

For the amateur and also the rapidly growing commercial field, we have developed an entirely new line of apparatus, in which is incorporated the very latest advancement of the science of Radio.

Each individual unit is primarily a separate and distinct device, complete in itself, yet by adding one to another any combination may be obtained, from the simple crystal detector through all the stages of radio frequency and audio frequency amplification.



Signal Crystal Detector, Type 110

Rear view showing perfection of detail in finish, formica back, nickel plated binding posts for connecting other units, etc.

The instrument illustrated is undoubtedly the best type of crystal set ever offered. Its special features include:

High grade 21-plate condenser
Device for locking cat whisker into positive position after live spot is obtained. No jarring or vibration of the set can destroy this positive contact

Range 150 to 600 meters, which may be increased to 12000 meters by attaching loading coils.

Space forbids complete description. Send for our Booklet and Special Bulletins. For certainty of Radio results insist on SIGNAL parts and sets

For Sale by Dealers Everywhere
(1898A)

Seasoned knowledge and experienced handicraft are built into these units—the product of a plant and an organization whose history in Radio dates back to the earliest days of “wireless.”

SIGNAL Electric Mfg. Co.

Factory and general Offices

1915 Broadway, Menominee, Mich.

Atlanta, Boston, Cleveland, Chicago, Minneapolis, Montreal, New York, Pittsburgh, St. Louis, San Francisco, Toronto.

You'll find our local address in your Telephone Directory.

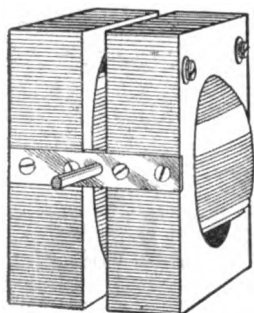
COUPON FOR GUIDE TO RADIO SATISFACTION

Signal Electric Mfg. Co.,

1915 Broadway, Menominee, Mich.

Please send, without obligation, your interesting book about SIGNAL parts and sets, to the name and address written in the margin of this page.

Make Your Own Receiving Set



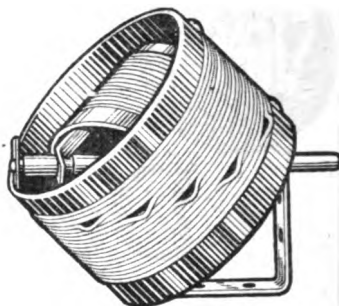
NATIONAL VARIOMETER
Complete Postpaid \$4.00

With These Parts

The National variometer and variocoupler are specially designed for the reception of wavelengths between 150 and 650 meters. Two of the variometers and the variocoupler make a regenerative receiver that will bring in loud, clear and properly tuned signals. Make your own set and save 40 to 50%

VARIOMETER

Beautifully finished, substantially built and absolutely accurate in every detail. Minimum clearance between Rotor and Stator insures highest degree of efficiency. Especially adapted for the reception of concerts, lectures and other forms of broadcasting. **\$4.00**



NATIONAL VARIOUPLER
Complete Postpaid \$3.50

VARIO-COUPLER

This 180° coupler permits the sharp tuning necessary to get distant stations. Wound especially to get the best results on amateur wavelength broadcasting. Positive contacts throughout. Neat in appearance, efficient in operation. Each, postpaid..... **\$3.50**

VARIOMETER PARTS—At Factory Prices

For the amateur who wants to wind his own variometer, we furnish the wooden parts and all necessary wire, screws, hardware, etc.

Wood Rotors—4" diameter, 2" wide, 90c
Wood Stators—4 1/4" square, with slots for bearing plates, postpaid, **\$1.00**
per pair.....

Wire, etc.—complete set of all wire, screws and hardware needed to wind and assemble the complete variometer as shown in illustration above, postpaid, per set..... **70c**

DEALERS, JOBBERS: ATTENTION

We manufacture these variometers and variocouplers in our own factory and have good stock ready for immediate shipment. Write for our very attractive prices.

NATIONAL RADIO CO., INC.,

1302 S. VANDEVENTER.
ST. LOUIS, MISSOURI

Getting Astounding Results

Amateurs in every state and many abroad as well have worked or heard 2ZL. His station is known from coast to coast. Many wonder how he does it. He has told the tale partly over the air, and partly to those who have been fortunate enough to visit him at Valley Stream, Long Island. Now for the first time the whole story has been put into print for anybody to read. J. O. Smith (2ZL) has written the book of the year:

MODERN RADIO OPERATION

By J. O. Smith

No theory, no mathematics, no formulas, just a straight account of how it is done by C.W., not only at 2ZL, but also at other famous stations such as 1ZE, 8ZG and 9ZG which were installed by Mr. Smith. Also, the story of broadcasting from WDY, WGY and WJZ.

Receiving too—by all types of sets, including the Armstrong super-regenerative circuit.

DO YOU KNOW?—The proper proportion of grid and plate current in transmitters? The relative merits of D.C. on transmitter tube plates; of A.C. with half-wave rectification; of A.C. with full wave rectification; of Kenotron-rectified A.C.? How much you can gain by adding more tubes to your transmitter? How and why C.W. beats spark in purity, damping and economy? All these and many other vital questions are answered.

"Modern Radio Operation," **\$1.75**

By J. O. Smith

"The Wireless Age" for one year... **2.50**

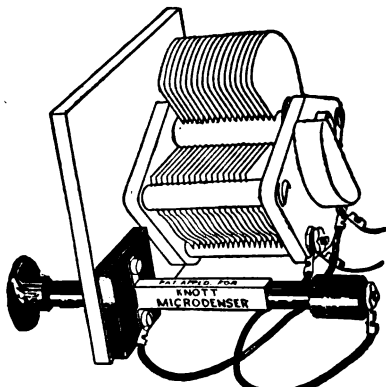
SPECIAL OFFER \$4.25

BOTH for \$3.75 (foreign postage, 50¢ extra)

WIRELESS PRESS, INC.

328 Broadway New York City

Knott Super-vernier Condenser



(Trade Mark Registered)

Showing how you connect to Condenser Tune in that message or music you have been losing. Tune out that interference. Bring it in and clear it up.

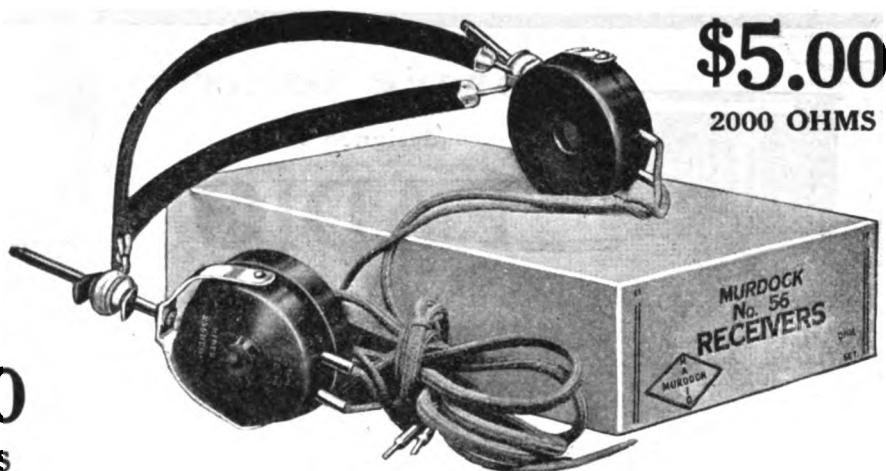
Tune your condenser to the whistle and then bring in the messages with this Micro. Buy it of your dealer, or send us \$2.75 and we will mail you one complete with connecting wires and wrench-screw driver.

Knott Sure Ground. Radio Name Plates. Patent Dial. Rheostat. Quodcoil. Cincoil. Microstat. Send Postal Card for Circulars. Jobbers write for our proposition. It will please you.

E. R. KNOTT MACHINE CO.

Boston 27, Mass.

\$5.50
3000 OHMS



**Backed by 17 years
of RADIO manufacturing—**

Since 1904 Murdock Apparatus has been in constant use by radio experts in many of their most important experiments.

The demonstrated success during these years enables us to positively guarantee the most satisfactory service from MURDOCK HEAD PHONES and other apparatus.

Nearly all the old time "amateurs" are familiar with the high quality of Murdock Apparatus.

SOLD BY DEALERS EVERYWHERE

*Sent direct on receipt of remittance
if your dealer does not have them.*

WM. J. MURDOCK CO.

**343 Washington Ave.,
1270 Broadway
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**Chelsea, Mass.
509 Mission St.
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MURDOCK PHONES

STANDARD APPARATUS SINCE 1904

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

139



Storage Batteries

designed for

RADIO



KICO "B" BATTERY

KICO "A" BATTERY

FACTS ABOUT KICO STORAGE "B" BATTERIES—

1. Alkaline type.
2. They eliminate noises caused from "Bs" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries sold with the privilege of receiving your money back if unsatisfied within a 90 day trial.
7. Neat, Efficient and Compact.
8. Unlimited life.

	Plain	With Panels
16 cell 22 volts	\$6.50	
24 cell 32 volts	8.00	\$12.00
36 cell 48 volts	10.00	14.00
50 cell 66 volts	12.00	17.00
75 cell 100 volts	16.00	21.00
106 cell 145 volts	21.00	26.00

Literature gladly furnished.

KIMLEY ELECTRIC CO., 1355 Fillmore Ave., BUFFALO, N. Y.

RADIO



FANS

Have you a detector set?
Then Listen in with our

\$5.00 ROYALFONE

13,000 ampere turns

This Headset gives results on
a detector set. Because it's
made for a detector set.

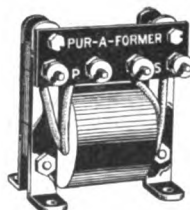
Ask Your radio dealer to let
you listen in with a

ROYALFONE

You will note the difference

If he hasn't one write to
ROYAL ELECTRICAL LABORATORIES
207 Market St., Newark, N. J.

Royalfone



PUR-A-FORMER
\$350

Here's an audio amplifying transformer without any frills or fancy finishes—just solid honest value. The PUR-A-FORMER is compact and strongly built—amplifies without howl or distortion. Takes minimum space in your set and will produce results equal to many selling at double the price. Winding ratio $4\frac{1}{2}$ to 1. Buy them at all good dealers.

HARRY ALTER & CO.

We Sell Wholesale Only

126 NO. MAY STREET, CHICAGO, ILL.

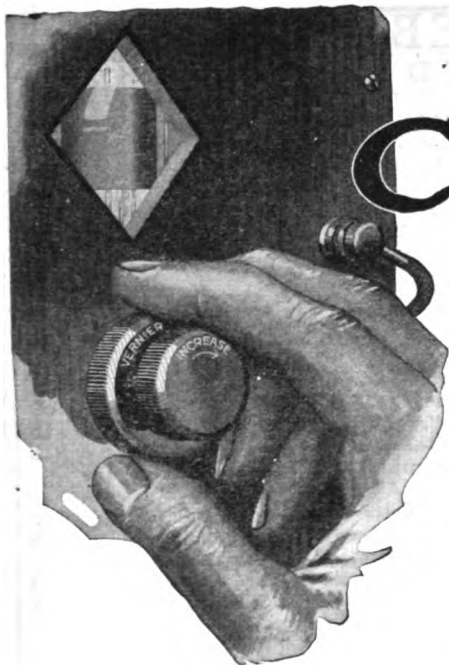
DEALERS ONLY—

Write for Harry Alter's RADIO "POCKET-BOOK." A net price catalog of radio supplies published each month. Our wholesale prices hit bottom. The RADIO "POCKETBOOK" sent free to dealers only. Use your letterhead.

HARRY ALTER & CO.

126 No. May Street, Chicago

We Sell To Dealers Only



Critical!

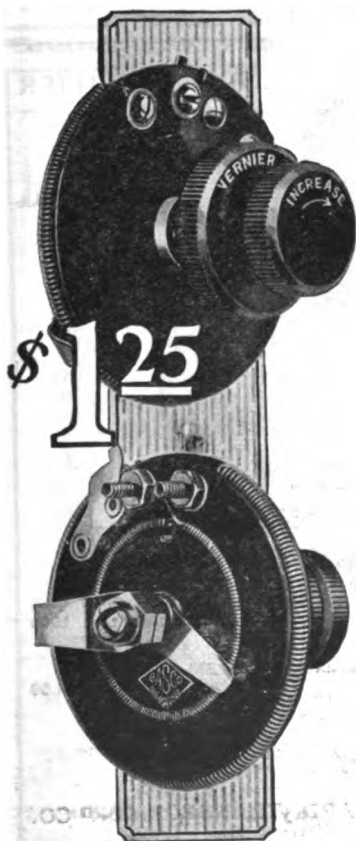
It's that Sharp Filament Adjustment that Pulls in the Long Distance Stations

CRITICAL filament adjustment—too fine for ordinary rheostats. That's what turns those C.W. "squeals" into clear, distinct signals. Whether it's voice or code you're after—long distance or greater clarity of tone—close filament adjustment is half the battle. "Get their carrier wave and you've got their signals"—that's the sentiment of every radio fan who uses a



Vernier Rheostat

Picks the Signals Out of 'Squeals'



Controls the most critical detector tube. Smaller knob gives coarse filament adjustment—larger one, an extra fine vernier adjustment. Smooth, easy action—positive contact always. Resistance coils rigidly inset in heat resisting fibre—no shifting of coils when in operation. All metal parts, binding posts, etc., heavily nicked. The Basco Vernier Rheostat represents the highest type of workmanship in EVERY detail. Get more out of your set with a Basco Vernier—the super-delicate filament rheostat. Costs no more than ordinary rheostats. Ask your dealer to show you one.

OTHER BASCO RADIO EQUIPMENT

Super-sensitive Receivers (2000 Ohm) \$6.00
(3000 Ohm) 7.50

Radio Frequency Transformers 5.00

Also Variocouplers, Variable Air Condensers, Tube Sockets. Switch Assemblies, Crystal Sets complete or as parts, Binding Posts, etc.

Jobbers and Dealers: Write for extra liberal discount and name of our nearest local factory representative.

Briggs & Stratton Co.
Milwaukee PRODUCT Wisconsin

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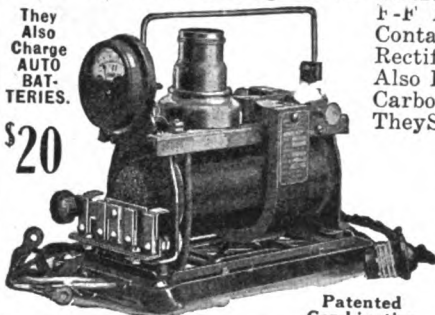
RADIO "A" & "B" STORAGE BATTERIES CHARGED AT HOME F-F RADIO RECTIFIER

FOR A FEW CENTS, FROM ANY 100 to 130
Volt 60 Cycle LAMP SOCKET, WITH AN

It Charges All 6 Volt RADIO "A" & AUTO Batteries; & RADIO "B" Storage Batteries Up to 120 Volts. It has Unlimited LIFE at Constant EFFICIENCY, with Nothing to Slop over, Burn Out, or cause trouble and It Will Charge a Dead Battery. They Charge Automatically, Operating Unattended. Leave Battery wherever it is, without even disconnecting it; Screw Plug in Lamp Socket, Snap Clips on Battery Terminals; Turn Switch & Battery will be Charged in the morning. Is it not gratifying to feel that Your Radio Batteries will never fail & You are always Ready to Receive RADIOPHONE Broadcast Music, Sermons & News; never having to be careful of or to tell Friends Your Batteries are dead? F-F BATTERY BOOSTERS are Complete Compact Self Contained Portably Handy Full Wave Automatic Magnetic Rectifying Charging Units, for 100 to 130 Volt 60 Cycle A.C. Also For Other Cycles. No Skill is Required. INFUSIBLE Carbon Rectifying Brushes Maintain Uninterrupted Service. They Save More Than They Cost & Last Lifetime. POPULAR PRICES:

They Also Charge AUTO BATTERIES.

\$20



Patented Combination

Eventually You Will Buy An F-F Rectifier. Why Not Now? It Costs You Less To Buy a Booster Than To Be Without One. All Types But B charge Auto Batteries. The Larger Types are for heavy Batteries, or Where Time is limited. Shipping Weights Complete With AMMETER & BATTERY CLIPS 11 to 15 lbs. Purchase from Dealer, or Mail Check for Prompt Shipment. If via Parcel Post add Postage & Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge Batteries from Farm Lighting Plants & D.C. Circuits & For GROUP CHARGING use our 12 Battery 8 Ampere Full Wave Automatic ROTARY Rectifier described in FREE Bulletin No. 31A. ORDER Now or WRITE Immediately for FREE BOOSTER Bulletin No. 31.

THE FRANCE MANUFACTURING COMPANY

OFFICES & WORKS

CLEVELAND, OHIO, U.S.A.
Canadian Representative: Battery Service & Sales Co., Hamilton, Ontario, Canada.



MARVELOUS MUSIC OF THE AIR

Beautiful concerts, instructive lectures, stories, the day's news—all radio entertainment comes true and clear with the

Stromberg-Carlson Radio Head Set

Unexcelled in tone; extremely sensitive. Forked cord permits simultaneous use by two observers. A perfected instrument.

You may order Stromberg-Carlson Radio Head Set and other apparatus from your dealer—or send for Bulletin No. 1029Q and order direct.

Stromberg-Carlson
Telephone Mfg. Co.
Rochester, N. Y.



Price \$7.50

AUDIO FREQUENCY AMPLIFIER



MOUNTED TYPE M

Silicon Steel Cores; Snell Design—Bakelite Terminal Board; Ratio—9 to 1; Insulation test 1500 Volts.

Mounted Type M—\$5.00

Semi Mounted Type SM—\$4.50

Unmounted Type UM—\$4.00

Discount 10% for cash with order

Designed by *Packard* Engineers—

a quality Name in Radio

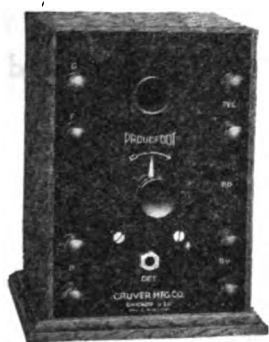
THE STANDARD TRANSFORMER CO.
Warren, Ohio

IMPROVE YOUR RADIO SET

USE

PROUDFOOT RADIO APPARATUS

"Built Like A Watch"



Front

DETECTOR UNIT COMPLETE

\$15.00

Special Features

Bus-BarJacks

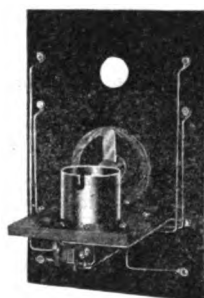
Built in Rheostats

Built in Condenser and Grid Leak

Closed Core Transformers

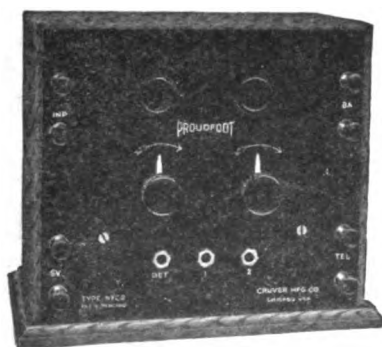
Direct Connections Without Lugs

Removal Panel—No Screws



Back

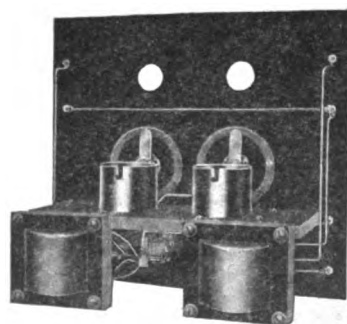
TWO-STAGE AUDIO FREQUENCY AMPLIFIER



Front

\$35.00

All
Units
Match



Back

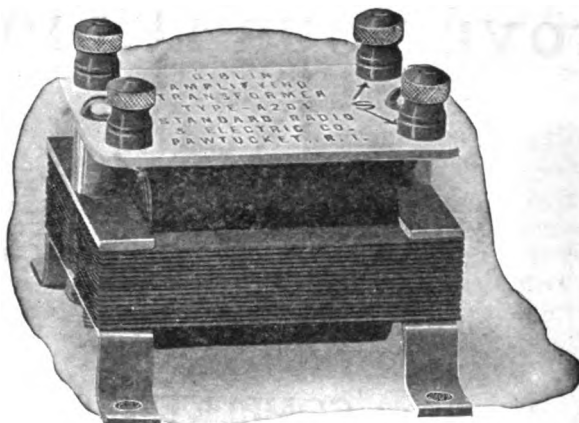
Cruver Mfg. Co., 2456 W. Jackson Blvd., Chicago, Ill.

Most Dealers Can Supply You With PROUDFOOT RADIO APPARATUS & PRODUCTS

If Yours Cannot. Write Us

ARE YOU FROM MISSOURI?

**Mounted
\$4.50**



**Unmounted
\$3.50**

In one month this Transformer has received approval from Maine to California

THEN TRY THIS

GIBLIN AUDIO FREQUENCY AMPLIFYING TRANSFORMER

Designed for use with standard amplifying tubes. Maximum amplification without noise or distortion.

May be placed in any position without pro-magnetic coupling or squealing.

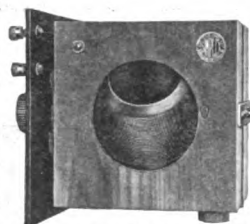
STANDARD RADIO & ELECTRIC CO.

PAWTUCKET,

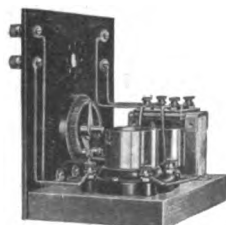
Liberal discounts to dealers

RHODE ISLAND

SIMPLEX—that's your safeguard



VARIO-COUPLER PANEL VARIOMETER PANEL



DETECTOR PANEL AMPLIFIER PANEL
Also Unmounted Variometers & Variocouplers

Simplex Panel Units make it possible to try out many different hook-ups without disassembling panels. These highly perfected units eliminate much of the uncertainty of success in receiving radio broadcasts because they have been designed by men having years of experience in radio activities. Get them from your dealer.

SIMPLEX RADIO CO.

1013-15 RIDGE AVE.,

PHILA., PA.

HERE

RADIO CITIZENS

Complete stocks carried for immediate shipment of the following apparatus:

Grebe Murdock
DeForest Adams-Morgan
Acme Radio Corporation
C. Brandes, Inc.
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FREE BULLETINS PRICE LIST

Get the new lowest prices on apparatus and supplies. Bulletins and price lists mailed FREE on your request. Send for them today.

Nash Electrical Service Co.
Marshall, Ill.

One-Three-Five Years from Now?

TIME and use are the great laboratory tests for radio telephone receiver quality. What will your head-set be worth after months and years of use? Will the steel still retain its magnetism? Will the assembly still exhibit that accuracy so necessary to the critical needs of radio? Will the tone and volume still have those finer qualities that they possessed in their newness and youth?

*Will YOUR head-set be in service one year from now?
Three years from now? Five years from now?*

-here's
what one
user has to
say of-
"Red-Heads"

The Newman-Stern Company
Cleveland, Ohio
Dear Sirs:

I have a pair of your "Red-Head" receivers purchased about three years ago.
I have carried them with me over 20,000 miles in suitcase or sea-bag whenever they were not on the table or thrown into the drawer.

They have been dropped on steel decks during rough weather; thrust on the table with a bang when the static was exceptionally annoying.
In fact, they have come through the hardest kind of hard service. They are scratched and nicked all over, but I am happy to say they are still on the job, and as clear-toned as ever.

Yours very truly,
Ralph

THE goodness and efficiency of "Red-Head" Receivers is not a matter of accident. They were designed by skilled radio engineers who understood what was needed to make the right kind of radio phones—the kind that would stay right. In these seven years that they have been on the market, "Red-Heads" have come into use the world over.

At the new low price of \$6.50, they are unquestionably the biggest value on the market today in 3000-ohm, aluminum back receivers.

You take no risk when you buy "Red-Heads." We guarantee them *absolutely*. Your money back if you are not satisfied.

RED-HEADS

Triumph in Radio Receiver Design

**-NOW
\$6.50**

At your dealer's or sent direct on receipt of price.

The Newman-Stern Co.

Newman-Stern Bldg., CLEVELAND, OHIO

Producers of "Red-Head" radio receivers, "NAA" Arlington Tested Detector Crystals and the Teagle line of better radio apparatus. Send for descriptive bulletins.

DEALERS: The Newman-Stern Co. is a pioneer radio organization. The radio instruments we put out have gained a wide reputation. It will pay you well to write for our dealer proposition.

**THE NEWMAN-STERM CO.
CLEVELAND, OHIO**

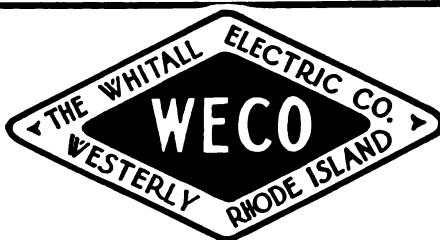
Gentlemen:—Enclosed is Money Order for \$6.50 for which please send me a pair of "Red-Head" Receivers. It is understood that if I am not completely satisfied with these phones, I may return them within seven days and get my money back.

Name

Post Office Address

The name of my dealer is

SERVICE



SATISFACTION

RADIO ESSENTIALS

We have for Immediate Delivery Westinghouse RC Sets, Radiotron Tubes, and Radio Corporation UV-712 Transformers

Radiotron UV-200, detectors.....	\$5.00	Clapp-Eastham RZ Sets.....	\$100.00
Radiotron UV-201, amplifiers.....	6.50	Clapp-Eastham HR Sets.....	40.00
Radiotron UV-202, 5 watt power..	8.00	Clapp-Eastham HZ Sets.....	40.00
Radiotron UV-203, 50 watt power..	30.00	Westinghouse RC Sets.....	132.50
Brach Arresters, inside.....	2.50	Westinghouse Aeriola Sr.....	65.00
Brach Arresters, outside.....	3.00	Western Elect. Tel. 2200 ohm..	10.00
WECO Dials, 2 1/4" rheostat.....	.30	Murdock Tel. 2000 ohm #56....	5.00
WECO Dials, 3 1/4" Instrument....	.35	Murdock Tel. 3000 ohm #56....	6.00
WECO Dials, 3 1/2" Instrument....	.40	Frost Tel. 2000 ohm #162....	5.00
WECO Sockets No. 707, moulded..	.75	Frost Tel. 3000 ohm #163....	6.00
Paragon Rheostats.....	1.50	Connecticut Tel. 3000 ohm....	7.00
Vernier Rheostats.....	1.00	UV-712 Trans.	7.00
Crystal Detectors.....	1.00	Variometers Reg. Price \$6.50..	3.95

We are distributors for the Radio Corporation, Clapp-Eastham, Murdock, Frost, Remler, Signal, Federal, Acme, General Radio, Bristol, Everready, Willard, Brach, Keystone, Conn. Tel. & Elect., and others.

We have SPECIALS each month, write for our special bulletins.

"You will like trading with us." Try us and see

Send 6¢ for our catalog.

WHITTALL ELECTRIC COMPANY,

Dealers write for discounts.

WESTERLY, RHODE ISLAND

THE

Sterling

LINE OF FINER RADIO EQUIPMENT



RADIO and AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

The design of these two pieces of apparatus incorporates the best principles of Radio Engineering. Both



are identical in outside dimensions and appearance and together form efficient and attractive additions to any tube set. No. R 301 Audio Transformer (best suited to modern vacuum tube characteristics). Price \$4.00. No. R 302 Radio Transformer (will operate on any wave length). Price \$6.00.



STERLING RADIO METERS

Unusually accurate and thoroughly reliable for indicating filament control of detector and amplifier tubes and other uses where accurate measurement is necessary. Large scale production has lowered the price of

these quality instruments. Ammeters and voltmeters furnished in all standard scale readings. R 321—R 342.....Price, \$4.00 R 343—O-100 D.C. Voltmeter....Price, \$5.00 charging rate optional, 5 or 10 amperes. Price complete with plug, cord and charging leads, \$16.00. (West of Rocky Mts. \$17.00)

WE ALSO MANUFACTURE—STERLING PORTABLE RECTIFIERS, STERLING FILAMENT RHEOSTATS AND POCKET VOLTMETERS FOR TESTING "B" BATTERIES.

THE STERLING MFG. COMPANY
2831 PROSPECT AVE., CLEVELAND

"EURACO" PRODUCTS

(Guaranteed)

**Compact — Interchangeable
Most Efficient — Accurate:**

60
Cents
per
Unit



60
Cents
per
Unit

**Mica Condensers — Grid Leaks
Mountings:**

Interesting Proposition for Dealers
EUROPEAN RADIO CO.
1342 East 22nd Street, Brooklyn, N. Y.

35c. Each

3 for \$1.00 **Na-ald
Genuine
Condensite Dial**



The dial that runs true.

Numerals engraved on bevel and knob so shaped that fingers do not hide them.

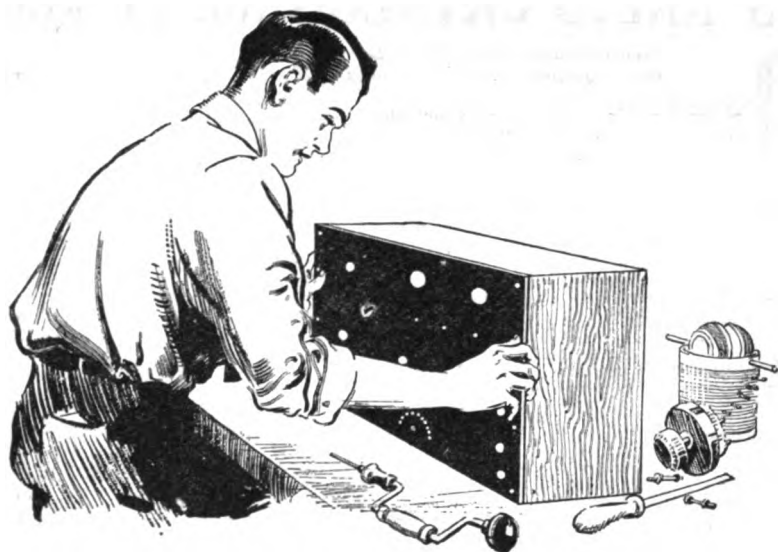
Thin edge with clear graduation to make accurate reading easy. Concealed set screw in metal insert. Will not warp or chip. Finish and enamel permanent.

Low price with this quality possible only through quantity production.

Special dealer and jobber proposition. An opportunity.

ALDEN-NAPIER CO.

52 Willow St. Dept. M SPRINGFIELD, MASS.



Improve *Your* Set with a Panel of CONDENSITE CELORON

The better the insulation the finer your radio set will perform. Keep your connections tight and your insulation right. This is a radio axiom. Here is another; Get the best panel obtainable.

The essential qualities of a radio panel are non-conductivity, strength and appearance. Condensite Celoron is a strong, hard, waterproof material that will give you surface and volume resistivities, and a dielectric strength greater than you will ever need. In addition to this, this material machines readily, engraves with clean-cut characters and takes a fine, natural, polish or, a beautiful, dull, mat surface. Mount your equipment upon a Condensite Celoron Panel and note the improvement.

Are you a radio enthusiast? Step into your nearest radio supply store and get a Celoron Panel cut to the size you want. If by any chance that dealer cannot supply you write us direct.

Do you make radio equipment? If you are not now using Condensite Celoron let us give you the facts.

Are you a radio dealer? Send today for our special dealer's proposition covering Celoron Panels and Parts.

Diamond State Fibre Company

Bridgeport

(near Philadelphia)

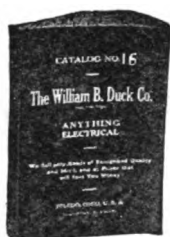
Pennsylvania

Branch Factory & Warehouse, Chicago

OFFICES IN PRINCIPAL CITIES

In Canada—Diamond State Fibre Co. of Canada, Ltd., Toronto

DUCK'S RADIO CATALOG No. 16 256 PAGES



Continuously since 1909 Duck's Radio Catalogs have never been equalled for completeness and great wealth of radio data

Send 25c in coin carefully wrapped for your copy of this wonderful book, the most unusual and complete catalog ever put between two covers. Not sent otherwise. Enormous cost and tremendous demand prevent distribution at a less retainer. Never in the history of radio has there been such a catalog. The radio data and diagrams embracing upwards of 50 pages give the experimenter more valuable and up-to-date information than will be found in many textbooks selling for \$2; and \$1 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth-while radio goods found in this great catalog.

Over 50 pages of latest hook-ups (wiring diagrams) and invaluable and up-to-date data and information on radio. Not only a catalog, but a wonderful textbook on radio.

Duck's Products Have Stood the Test of Time 1909-1922

There are many Duck products that completely dominate all competitive types.

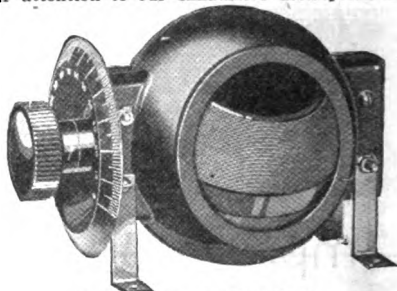
The Largest Line in America—62 Complete Instruments—58 parts.

DEALERS

We want live, responsible dealers in every city and town in the United States, both for the sale of our extensive line of radio apparatus and all other worth-while lines of radio goods, on all of which we can quote attractive dealer's discounts. We can offer you facilities and advantages that no other radio house can offer.

DUCK'S NEW MOULDED VARIOMETER
Our new moulded variometer (shown below) speaks for itself. For a comprehensive description of the design and radio thought back of our variometers, we invite your attention to our exhaustive description in catalog. In prettiness of design, compactness and lightness of weight, we have not seen any variometer that we believe compares with ours. The forms, unlike many others, positively will not warp.

No. A900 plate variometer, with knob and dial, \$7.25
No. A901 grid variometer, with knob and dial, \$7.25
Note: If knob and dial are not desired deduct 75c.



Duck's New Moulded Variometer

The WILLIAM B. DUCK CO., 243-245 Superior St., Toledo, Ohio

3000 OHM SETS, \$3.98

PLUS 20 CTS. POSTAGE AND PACKING

Satisfaction Guaranteed or Money Back



We mail phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as \$8 to \$10 Sets. Circular Free.

TOWER MFG. COMPANY

107 STATION ST., BROOKLINE, MASS.



BUY DIRECT

SAVE MONEY ON GUARANTEED RADIO EQUIPMENT

43 Plate Condenser without Dials.....	\$3.00
23 Plate Condenser without Dials.....	2.50
13 Plate Condenser without Dials.....	2.25
3" Dials.....	.60
Vacuum Tube Sockets (unbreakable).....	.65
Rheostats.....	.65
Mica Grid Condensers.....	.25
Mica Phone Condensers.....	.35
Grid Leaks.....	.60
Head Sets (3000 ohms).....	4.50

Money back if you are not satisfied. We operate on small margins. Send stamp if you want folder.

TEL-O-QUIK COMPANY

1446 Wilson Ave.,

Chicago, Ills.

TO RADIO DEALERS

State Territories NOW Open. Aggressive Dealers can make good profit selling Guaranteed Radio parts. Write for Complete Information.

Ray-Di-Co. Organization, Inc.

1215 Leland Ave.,

Chicago

JOY-KELSEY CORPORATION

Manufacturers

RADIO EQUIPMENT

4021 West Kinzie St. Chicago Ill.

Low in Cost Simple to manipulate



*Opened like
a book*



*Carried like a
satchel*

THE radio enthusiast who lives within ten to twenty miles of a broadcasting station has exactly what he wants in Radiola I (ER 753-A)—low cost, compactness, portability, and simplicity of manipulation.

Open the walnut cabinet, and on the front panel you find the tuning control, the crystal detector and the binding posts. In the body of the cabinet are the head-telephones. Tuck away the telephones, close the front panel, and you can carry the whole set as you would a satchel.

Radiola I at your dealers, \$25.00



*This symbol of quality
is your protection.*

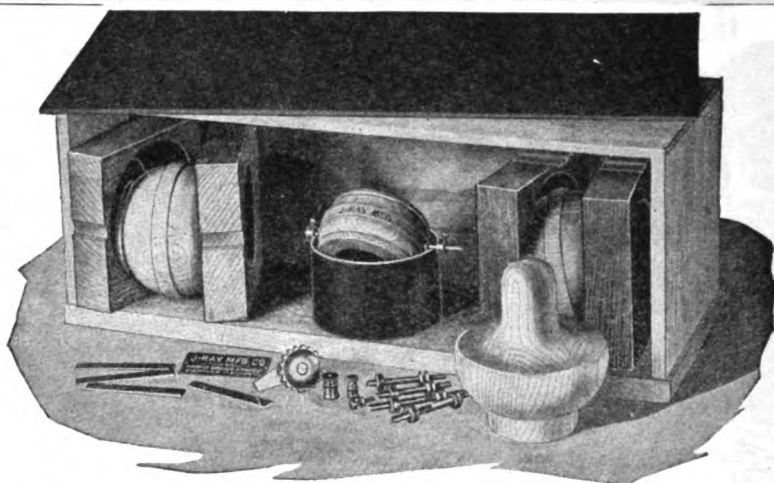
The Book That Brings Radio Into the Home. For 35 cents you can obtain from your dealer or from us a copy of the book "Radio Enters the Home." It explains the principles, the fascination of radio in plain English. It describes Radiolas and their accessories. It contains the most valuable wiring diagrams ever published.

Radio  **Corporation**
of America

*Sales Department, Suite 2068
233 Broadway,
New York, N. Y.*

*District Office
10 South La Salle St.,
Chicago, Ill.*

Why
Pay
More
When
You
Can -



Build
Your
Own
and
Save

—UNASSEMBLED RECEIVING SET—

When you buy a complete set you pay more for the assembling than you do for the actual materials and parts. J-Ray Unassembled sets save you money and give the satisfaction and fun of building your own.

JR-3 Tuner, Detector and 1 step amplifier set. Consists of—Polished oak cabinet $18\frac{1}{2} \times 7 \times 7$ with drilled Formica panel to fit. 2 Variometers and 1 Variocoupler wound ready to assemble. 3 Bakelite dials; 1 switch; 7 points; 2 stops; 6 binding posts (all parts nicked); 2 panel mounting sockets; 2 Fada rheostats; 1 grid leak condenser; 1 amplifying transformer; 2 jacks; 1 plug; all necessary brass parts, etc. with complete assembling directions.

Range with average antenna 1000-2000 miles. Price.....\$35.00

Same Set with J-Ray Moulded Variometers (assembled)..... 40.00

Bulletin 3 with other unassembled combinations mailed on request.

Dealers—We have attractive discounts on 15 articles. Write for list.

J-RAY RADIO MFG. CO., 1618 Chestnut St., St. Louis, Mo.

HYGRADE SPECIALS

Skinderviken Transmitter Buttons.....	\$0.75
Electrode Insulators (per Doz.).....	2.00
Binding Posts (rubber Cap) per dozen.....	.75
7 stranded Copper Aerial Wire 200 ft.....	1.25
Rheostats, Fada 75¢; DeForest.....	1.00
Klosner Vernier Rheostats.....	1.15
Murdock Rheostats (with dial).....	.85
Paragon Vacuum Tube Control Panel.....	5.50
Chelsea .0005 m.f. Variable Condensers	
(with dial & knob).....	3.98
.001 m.f.	4.25
Arkay Loud Speakers.....	3.89
Thordarson Amplifying Transformers.....	3.75
Acme Amplifying Transformers (mounted).....	4.25
Acme R-2 Radio Frequency Transformers.....	4.50
Federal Amplifying Transformers.....	5.95
Myers Audion High—Mu Tubes.....	4.49
2768 Eveready Variable B. Battery.....	1.98
LC. 100 DeForest 3 coil mounting.....	5.75
6 volt 30 amp. Marko Storage Battery.....	9.50
6 volt 60 amp. Marko Storage Battery.....	12.95
6 volt 80 amp. Marko Storage Battery.....	16.95
6 volt 100 amp. Marko Storage Battery.....	21.50

MARKO batteries are constructed with hard rubber jars, and are guaranteed for two (2) years. Batteries fully charged when shipped.

Above prices are F. O. B. New York

Hygrade Electrical Novelty Co.
41 West 125th Street, New York, N. Y.

RADIO CLUB PINS



Des. #987

An emblem made to order for your Club will work wonders—Write today for free 52 page catalog showing Radio emblems, c'ass rings and pins. Samples loaned to officers.

METAL ARTS CO., INC.
7753 South Ave., Rochester, N. Y.



SOUTHERN RADIO CORPORATION

Radio Engineers and Jobbers

905 Realty Building, Charlotte, N. C.

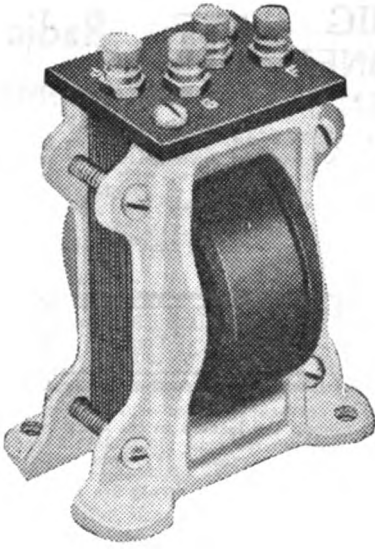
Armstrong Super Regenerative Circuit

Complete blue-print and descriptive matter	\$0.25
400 turn Honey-comb Coils (unmounted)	1.00
1250 turn Honey-comb Coils (unmounted)	2.40
1500 turn Honey-comb Coils (unmounted)	2.80
Add \$1.00 to above prices for mounted coils.	

We can also supply the necessary choke coils and 12,000 ohm resistance used in this circuit.

Dealers write for Discounts

FRANKLIN RADIO MFG. CO.
711 Penn Ave., Wilkinsburg, Pa.



\$6.00 from your dealer. No exposed wiring to break or short. Can't be incorrectly connected. No impregnating compounds for insulation, thus avoiding noises due to losses. **TESTED FOR 600 VOLTS A. C.** Ideal for power amplification. For use with any V. T. in any circuit. **REMEMBER THE NAME—3 Y Q.**

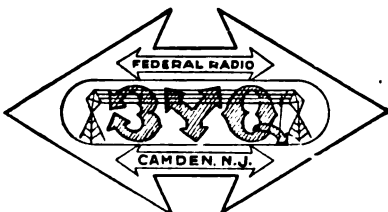
Joy With Every Step

We invite you to pass judgment on a remarkable achievement in Audio Frequency Amplification. In the name of the 3 Y Q Transformer you have been promised amplification without distortion and Radio Engineering ability has completely filled that promise.

Delving straight to the heart of good engineering, radioists demand the rarest, the most unusual trait in a transformer—absolute dependability. They require that the transformer of their choice shall be so correct electrically, mechanically and in theory that they need give it no thought save admiration for its consistent, flawless performance.

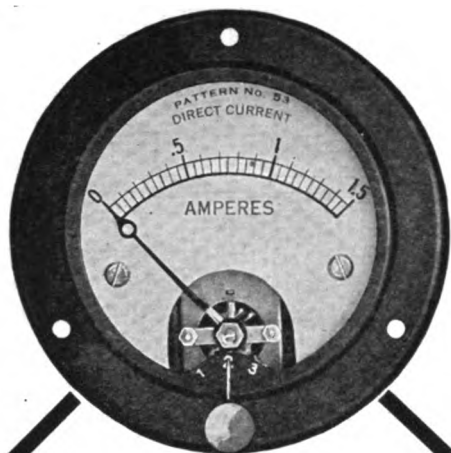
The 3 Y Q Transformer meets those requirements. There is amplification in 3 Y Q Transformers that gives joy with every step. Howling and distortion due to electrical leaks and high mechanical resistance has been eliminated by master Radio Engineering construction. New mechanical and constructional laws have been proven true by 3 Y Q results.

The proof of these facts rests with you. Discriminating radioists everywhere are according first place in their favor to the 3 Y Q Transformer. It deserves the same favorable verdict from you and, once you have tried and tested the 3 Y Q Transformer, that verdict will be assured.



Federal Institute
of
Radio Telegraphy

2nd & Federal Sts., Camden, N. J.



TRIPLEX FILAMENT METER

Filament control by the use of proper instruments in receiving sets is the trend of the times. The Jewell triplex filament instrument, made as an ammeter or voltmeter, places on your panel the proper means for controlling the filaments of three tubes. It has a self contained mechanism for switching to either tube and being of small size, can be accommodated on the most compact tube set.

PRICE \$10.00

We were the first to supply a complete line of miniature radio instruments of uniform size. Ask your dealer or write to us for complete radio circular.

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

JOBBERS AND DEALERS BIG MONEY IN **RTS** Radio Equipment

The demand for RTS Equipment has become so great that for two or three months we have been behind on orders. But now, with our greatly enlarged plant, we are able to supply standard and special equipment to dealers and jobbers in any quantity.

We show here one article that has proven exceedingly popular.



The RTS Condensers shown above are standard in type and among the leaders in the industry. They eliminate howling, clear up phone speech and make the tubes perform perfectly. Furnished with mountings complete, ready for connections. Every condenser is thoroughly tested. They are made in three capacities.

	Retails at
Grid Condenser .0005 M. F.	30¢
Grid Condenser & Leak, combined	45¢
Phone Condenser .0013 M. F.	30¢

This new R. T. S. Cord Tip Jack leads the way in price particularly. Used in place of ordinary jack in Detector and last stage of amplification, and in place of binding post and for experimenters in making any desired connection.



A—Illustrates inside of jack. Constructed of spring phosphor bronze highly nickel plated. By method of a wiping spring contact a clean and positive connection is always assured. Where others sell from \$1.00 to \$2.50 the R. T. S. Cord Tip Jacks are 50¢ per pair.

Amateurs order direct from dealers. If they can't supply R. T. S. will supply you direct.

JOBBERS AND DEALERS OPPORTUNITY

Now is the time to cash in big profits! Amateurs in all parts of the country are demanding RTS Equipment and Specialties. Write today for price lists and liberal discounts to the trade.

RADIO TESTING STATION

Dept. Q-11, 25 Sturgis Street
Binghamton, New York



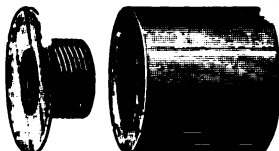
Na-ald Small Space V. T. Socket

35¢ each, 3 for \$1.00, Moulded genuine condensite. Requires but small space for mounting. Readily accessible binding posts. No excess metal to interfere with efficiency. Unaffected by heat of bulb or soldering iron. Phosphor bronze contacts. Nickel plated brass binding screws. Slash cut slot. Price possible because of large production.

Special proposition to dealers and jobbers.

ALDEN-NAPIER CO.

Dept. M.
52 Willow St., SPRINGFIELD, MASS.



ATTENTION RADIOTICS
IF YOU USE AMPLIFYING TUBES
you can make your Victor talking machine a RADIO LOUD SPEAKER, with a "BEEKO" Radio-Phone attachment.

Sample by mail, 40¢.

Liberal discount in quantities

J. H. BUNNELL & CO.

32 Park Place, Department Q New York



Radio "A" and "B" Batteries in Hard Rubber

"A" Batteries-- One Size only-- 6 Volts--75 Ampere-hours

Case—Hard Rubber
Cover—Hard Rubber
Base—Hard rubber
Handle—Reinforced Hard Rubber.
Plates—Positive $\frac{1}{4}$ "
Negative $\frac{1}{4}$ "
Outer Neg. $\frac{1}{8}$ "
Separators—Port Orford Cedar
 $\frac{1}{4}$ "
Cover Bushings—Non-Leak
Connections—2, 4 or 6 volts.



LIST PRICE
Charged—Ready to use

Battery and
Handle..... **\$20.00**

Cover, extra..... **\$2.00**

Radio demands and deserves the Best

Eliminate the Noise Nuisance

Much of the "crackling" and "frying" blamed to "static" is caused directly by second-hand automobile starting batteries, automobile-type thin-plate, thin-separator, "Radio" "A" Batteries, and defective or partly-discharged Dry "B" Batteries or flashlight cells.

Steady, dependable Voltage is given by USL RADIO "A" AND "B" BATTERIES Designed for and made only for Radio Service by a world's leader in Storage Battery Manufacture.

"B" Batteries -- One Size only -- 24 Volts -- 2 Ampere-hours

Case—Hard Rubber
Covers—Hard Rubber
Plates—Positive $\frac{1}{2}$ "
Negative $\frac{1}{2}$ "
Separators—Port Orford Cedar
 $\frac{1}{2}$ ".
Terminals—Brass
Connections—2 to 24 volts



LIST PRICE
Charged—
Ready to Use

\$11.00

Non-Slop and Non-Leak
In Any Position

Guaranteed under the standard USL Service Policy

USL Radio "A" Batteries

Also in Wood Cases

Mahogany or Mission-Oak Finish

PRICE LIST

DXA 303X—24-30 Amp Hrs. \$11.50
DXA 305X—65-75 Amp. Hrs. \$15.00
DXA 307X—95-105 Amp. Hrs. \$22.00
DXA 309X—130-140 Amp. Hrs. \$28.00
(In Canada—20% additional)

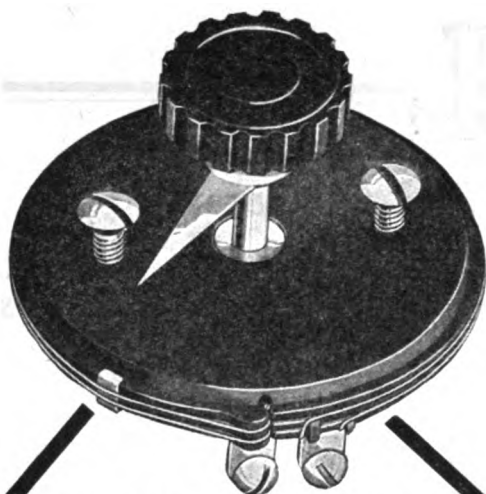
118 Central Distributing Points
5000 USL Battery Stations and Dealers
Everywhere

U. S. Light & Heat Corporation

NIAGARA FALLS, N. Y.

Factories

Niagara Falls, N. Y., Niagara Falls, Canada,
Oakland, Cal.



VERNIER RHEOSTAT

The Jewell vernier rheostat is extremely simple and substantial in construction, employing a new principle of contact which we have patented. Made of the highest grade bakelite and using the best resistance wire obtainable. Very fine adjustments are obtained by a single turn of the knob. Ask your dealer or write to us for special circular.

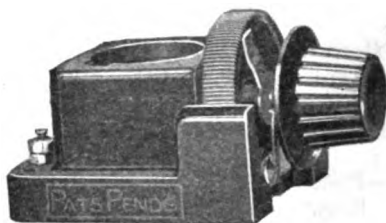
PRICE \$1.00

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

KING Rheo-Socket

Another Radio Surprise

Price \$3.00, f. o. b. New York City



Compact, increased efficiency, shorter connections, less wiring—brings in stations you never heard before. Make this a part of your up-to-date set.

A high grade article in Red Bakelite with Phosphor-Bronze Contacts and Alloy Resistance Wire.

For Base or Panel Mounting.

KING AM-PLI-TONE
82 Church Street, New York

NOVO "B" BATTERIES FOR RADIO

28½-45 & 105 VOLTS

**NOISELESS
DEPENDABLE
GUARANTEED**

ASK YOUR DEALER

NOVO MANUFACTURING CO.
424-438 W. 33rd ST.
NEW YORK

531 SO. DEARBORN ST., CHICAGO.

APEX SERVICE

All orders shipped same date as received. Try our service—you will like it. Price bulletin sent on receipt of 2¢ stamp.

Frost Phones—2000 ohms.....	\$5.00
Frost Phones—3000 ohms.....	6.00
Brandes Superior—2000 ohms.....	8.00
Western Electric—2400 ohms.....	12.00
Baldwin Mica Diaphragm.....	16.00
Radiotron UV200 Detector.....	5.00
Radiotron UV201 Amplifier.....	6.50
Radiotron UV202 5 Watt Power Tube.....	8.00
Air-Way Variometer.....	4.50
Air-Way Variocoupler.....	4.50
Standard Variable Condenser 11 (.00025 mfd.)	3.25
Standard Variable Condenser 21 (.0005 mfd.)	3.50
Standard Variable Condenser 41 (.001 mfd.)	4.00
Apex Bakelite Dial 3", ¼" or ⅜".....	.75

APEX RADIO COMPANY, INC.
1105 W. 69th St., Dept. Q, Chicago, Ill.



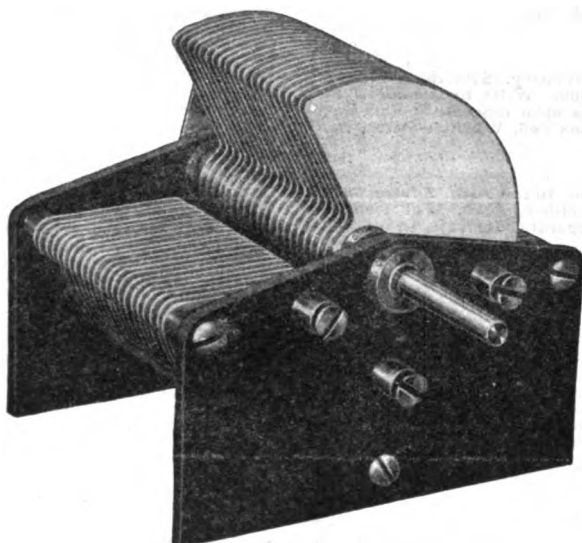
**It Pays To Buy
Where You See
This Sign**

Mr. Dealer:—If you are a progressive merchant you will be interested in this sign. Write us.

SHIP OWNERS RADIO SERVICE, INC.
Wholesale Distributors 80 Washington St., N. Y.

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

Wimco Announces



THE WIMCO VARIABLE CONDENSER

After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

The WIMCO Variable Condenser is now in production and your orders will have our best attention.

We have a very attractive proposition for the Jobber, and solicit inquiries. Write for complete price list and discount sheet.

THE WIRELESS MANUFACTURING CO.
CANTON, OHIO

Manufacturers — Distributors

CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 10th of month for succeeding month's issue.

WEST COAST signals all over the room with 4GL radio frequency transformers. Range 200-600. Price \$3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

PRINTED CARDS and Stationery. (Something Different. Printed cards \$3.75 per 500. Write for samples. Stationery samples and prices upon request. F. Earl Beaudry, Radio 4FA. P. O. Box 746, Winston-Salem, N. C.

FOR SALE—Regenerative tuner with 2 step, \$100, with tubes, batteries, rectifier, \$150. Will trade for alto saxophone. Other apparatus for sale. Grant Boltz, St. Marys, Ohio.

HAVE 900 CYCLE, 200 watt self excited alternators for sale. Are like new. Price \$25. Great for the plates of those tubes and some sets. Dope on request. Also have high voltage transformers for spark. V. M. Bowers, 1655 W. Congress, Chicago, Ill.

WANTED: Omnigraph with Continental dials. Write Dr. Peter J. Brown, Racine Wis.

RUBBER STAMP with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred Post Cards 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

VARIOMETERS (Mahogany) \$3.50; 23 Plate Condensers \$2.70; 43 Plate Condensers \$3.40; Switch Levers \$0.40; Nickel Plated Switch Points per Doz. \$0.20; Westinghouse 1½ volt Tubes \$8.00; Sockets for Westinghouse Tubes \$1.50; Manhattan & Turney Phones. Cash or M. O. Add Postage. Columbia Radio Company, P. O. Box 1720, Washington, D. C.

RADIO STORAGE BATTERIES \$6.50 to \$15.50 Miraco Radio Products. Aeroplug Aerials \$1.50 ea. Send stamp for folders. Lloyd E. Clark, 383 Broadway, Everett 48, Mass.

COMPLETE SET OF NEW PARTS for 3 step variometer set, including panel, knobs, cabinet and tubes. Want 3A or 5 x 7 Graflex camera. Box 1060, Greensboro, N. C.

FORCED SALE: DeLuxe Short Wave Regenerative Tuner-Detector, \$29; Supreme Quality two stage Amplifier, \$22; New Hammond Mathematical Typewriter, \$60; \$55 Vocaloid at highest bid; Standard Detector 2 step \$26; Big list radio parts at half price. Palmer Craig, 3401 Glenmore Ave., Cincinnati, Ohio.

LOOK! 9BUD's 20 watt C.W. Fone. Everything complete to use \$250.00 Cash. Write for details. The best set in materials, design and operation you ever saw. Act now. Box 967, Ogden, Iowa.

EXCELLENT CONDITION: Clapp-Eastham HR Receiver, \$25; Amrad Coil, gap and electrolytic interrupter \$15. Thordarson Transformer, \$3; Donald Detwiler, 1120 Va. Ave., S. W. Washington, D. C.

FOR SALE: Grebe CR-5 (150-3000m.) regenerative receiver and detector, slightly used, \$75; Grebe type RORD detector and two-step with UV-712 transformers, \$65; Short wave regenerative (Baldwin variometers and variocoupler in Grebe cabinet) \$65; General Electric AA-1400 detector and two-step (metal cabinet), \$70; R-3 Magnavox loud speaker, \$40; Pair Seibt 2000 ohm fones, \$14; Pair Western Electric fones \$8; F-F Battery Booster, 6 amps, \$12. All apparatus guaranteed in excellent condition. Sent postpaid East of Mississippi on receipt of price. Jack Dunham, 49 Overlook Circle, New Rochelle, N. Y.

FOR SALE: To close out business, all articles brand new, guaranteed. 10 Howard Rheostats, 80¢ each; 6 Paragon Sockets 75¢ each; 8 Radiotron Amplifier tubes \$5.25 each; 1 Hipwell Multiphone, \$2.00; 1 Telmacophone, \$15.00; 3 Kasia Radio Frequency transformers, \$3.50 each; 2 Radio Corporation UV-714 Transformers, \$5.00 each; 1 Brach Lightning Arrestor,

\$1.90; 1 Ramler Detector Panel \$6.50; 2 pair Murdock 250 2000 ohm phones, \$3.75 each; 5 S.P.S.T. Switches, 22¢ each; 70 switch points, \$1.40; 1 single circuit jack, 70¢; 2 Filament control 2 circuit jacks, 90¢ each; 2 Acme Audio transformers, \$3.75 each; 1 UL1006 Helix, \$8.25; 3 UC1014 Condensers, \$1.75 each; 1 UP1016 Power Transformer, \$31.00; 1 6000 ohm grid leak, \$1.00; 4 UT841 Sockets, \$1.75 each; 2 Kenotron UV217 Rectifiers, \$22.50 each; 1 G. R. 0-10 H.W.A., \$4.00; 1 UT1357 Magnetic Modulator, \$9.00; 2 Penn C Junior Regeneratives (Write for description), \$35.00 each; 1 Penn C 2 Stage Audio Amplifier, \$35.00; 1 Magnavox R-3 \$36.00; ½" spools \$24 S. C. wire, 40¢; 1 18x6x½ Formica Panel, \$1.75; 3 feet Formica 3½" tubing, \$2.00; 1 Gross O. H. N. P. Wood Screws, \$1.00; 24 6x6 Formica Panels, 25¢ ea. Will ship C.O.D. Send your order today. Eastern Ohio Radio Co., East Palestine, Ohio.

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FOR SALE: Two thirty foot steel radio towers special construction. Flat top antennae, 5 wire also if desired. Full particulars from R. F. Fowler, Frankfort, Indiana. 9BK.

FREE—We will give you a copy of "Twenty Radiophone Diagrams" free with your order of \$15.00 worth of radio supplies. We have a complete line of standard apparatus, tubes, etc., etc., at standard prices. Try our service and you will use no other. Twelve hour service or your money will be returned. Florman Radio Laboratories, Dept. B, McPherson, Kansas.

AMAZING PRICES on standard equipment, lists free. Rectifier Plates, 72 square inch sheets. Lead 60¢, Aluminum 75¢. Stewart Semi-Dry Mahogany Radio Batteries, 80 amperes, \$14; 100—\$16. Two years written guarantee. Howard Frazier, 5714 Hazel Avenue, Philadelphia.

UV 203 FOR SALE—Never used with socket \$25.00 plus express. Radio SSR.

SELL: Half kilowatt Thordarson, \$10; Murdock O. T. \$3; 2 Murdock Condensers, \$1.50 each; Murdock aerial switch, \$3; Remler variometer, \$3. Fliny Goddard, Leonia, New Jersey.

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TENTH HP Emerson DC Motor, \$10. Hazen, 627 Fillmore, Topeka, Kansas.

\$1.00 RADIO FREQUENCY TRANSFORMERS—Hear distant stations. Designed to fit any standard socket. Three sizes 160-500M; 500-1000M; 1000-2000M. Complete set of parts and full directions for assembling, postpaid, \$1.00; 3 for \$2.75; 6 for \$5.00. Arkenberg Agency, 702Q, World Bldg., N. Y.

LOOK: Formica Panels 6-12, \$0.95; 6-21, \$1.65, Mahogany finished cabinets to fit respectively, \$3.00, \$4.00, Radiotron Detectors \$4.50, Murdock fones, \$4.50, Manhattans \$5.40, B Batteries 22½ volts \$2.50 and \$1.80 each, Variocouplers, \$4.50; Crosley Variables Model B, \$1.65. Home Radio Company, 140 Liberty Street, Bowling Green, Ohio.

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BARGAINS: Grebe CR3, \$35.00; 50 watt Acme C.W. Transformer, \$11.75; UV201's, \$5.75; Baldwin Fones, \$13.50. Write for list. Henry Kufikowski, Ansonia, Conn.

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FIRST \$25 Money Order takes my Reinartz Tuner. Fernica panel—Croesley cabinet. Also 2 Chi-Rad Varimeters \$3.00 apiece—Croesley Condensers, \$1.00—Rhamsime Amplifying Transformers, \$3.00. 9CHF, Rubert Lewis, Princeton, Ill.

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FOR SALE: All Brand new apparatus, never used. 3 pra. Federal 2200 ohm Receivers, \$6.75 each; 5 pra. Murdock, Number 56, 3000 ohm receivers, \$5.00 each. 2 Paragon Vt. Controls, \$4.75 each; 1 Westinghouse RA. Tuner, \$55.00; 1 Westinghouse detector and two step amplifier, type DA, \$60.00, 1 Radio Corp. Microphone Transformer, \$5.00; 1 Magnavox two step power Amplifier, \$55.00, 2 Brach outdoor lightning arresters, \$2.50 each; 2 Brach Indoor Type Arresters \$2.00 each; 4 UV200 Detector Tubes, \$4.25 each. 5 UV201 Amplifier Tubes, \$5.50 each. All sent prepaid, everything guaranteed to be brand new. Have more parts, etc. Wesley Robinson, Jr., St. Marys, Georgia.

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SELL: "E" Baldwins \$8. Two-step tubes \$25, Detector panel \$6, Duplex Rotary Gap \$15, OT, \$2.50. Ted Rosser, Crawfordsville, Ind.

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TWO NAVY DYNAMOTORS for direct current, each 27 volts, 90 Watts, input; 350 Volts, 30 watts, output. In spring frame, \$45.00. Singly \$22.50. Ten watt C.W. Transmitter—Weston thermomometer, two selected "E" tubes, \$45.00. All \$80.00. Silver, Room 202, 51 East 42, New York.

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SELL: Magnavox, \$36; 43 plate variable, unmounted, \$1.75; "J" tube, \$6.50; all new; money order, plus postage. Fred Timper, 3238 Steuben Ave., New York City.

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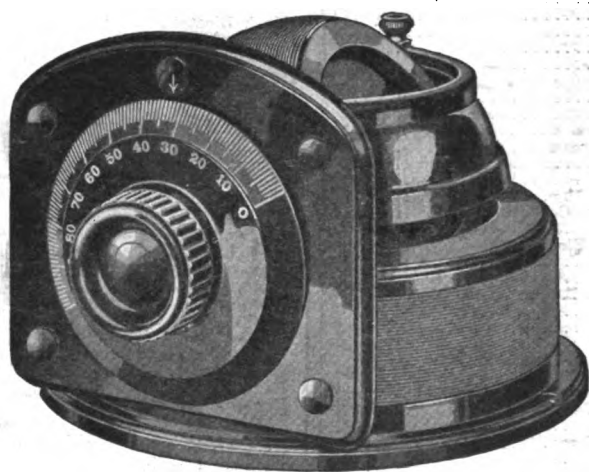
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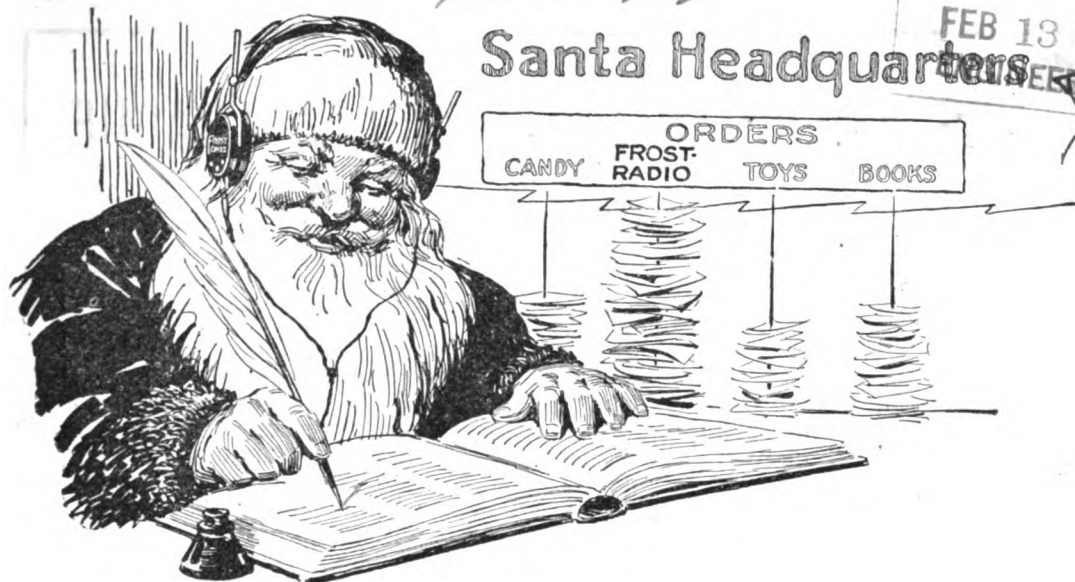
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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by by a board of seventeen Directors, elected every two years by the general membership. The officers, in turn, are elected by the Directors from their number. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its Board.

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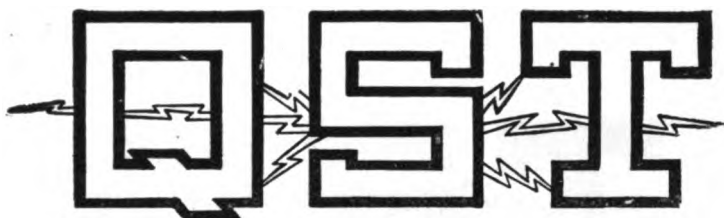
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The Official Organ of the A.R.R.L.

VOLUME VI

DECEMBER, 1922

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.



The Old Man

This photographic study was designed by Mr. M. B. Grogan, Publicity Committee Chairman, The Milwaukee Amateurs' Radio Club (Local Section, A.R.R.L.), in the studio of the Grogan Photo System. The picture is supposed to portray "T.O.M." all dressed up in his "Sunday-go-meeting" clothes in the act of listening in for a few minutes while waiting for his O.W. to get ready to accompany him. From the expression on his face we think he is getting either an earful of regular QRM or some Rotten Broadcasting.



A Magazine Devoted Exclusively to the Radio Amateur

QRV for the Tests?

AMATEUR Radio all over the world recently took up a notch in its belt, rolled up its sleeves, and for the last several months has been quietly but energetically at work preparing for the big International Amateur classic, the Transatlantic Tests. In the United States and Canada on this side, and Britain and France on the other, in particular, amateurs have been busy for it is these countries which will chiefly participate.

found. At this writing the exact limits of the band of wave lengths in which European amateurs will transmit are not known, but this information will be broadcasted thruout the country by the A.R.R.L. Operating Department shortly before the tests begin.

At the request of the League, the Wireless Society of London has accepted responsibility for the arrangements in Great Britain and appointed a sub-committee to



By the time this issue of QST reaches our readers the final details will be known to all amateurs. Elsewhere in this issue tables appear giving the schedules, the first ten days of which are occupied by American and Canadian transmission, with Europe listening, and the last ten days *vice versa*. North American transmission is divided into free-for-all periods and individual periods for the better stations making the mark in the October preliminaries. The European transmission periods will be divided equally each night between British and French amateurs, for which another table will be

deal with the matter, consisting of Major H. Hamilton, D.S.O., Commander C. F. Phillips, A.M.I.E.E., Mr. P. R. Coursey, B.Sc., A.M.I.E.E., Mr. G. G. Blake, M.I.E.E., and Capt. Norman Lea, B.Sc., A.M.I.E.E. This committee is receiving transmission entries, assigning places in the schedules, and will be the recipient of the sealed code letters from this side and the official judges of British reception. In addition the Wireless Society of London is arranging for transmission by amateurs from two special stations being constructed near London. The Manchester Wireless

Society, affiliated with the Wireless Society of London, is now almost ready for tests from their 1 k.w. tube station at Baguley, call letters 2FZ, and have also made application for license for a second station at Swinton, near Manchester, to work alternately with the first one. The British men are going about their organization in their usual thorough manner and every indication is that they will be successful.

In France an executive council has been formed of representatives of the three national societies having amateur members, known as the *Comite Francais des Essais Transatlantiques*, with offices at 19, Blvd. de la Republique, Versailles. The committee consists of Messrs. Dr. Pierre Corret (of la *Societe Francaise d'Etude de T.S.F.*, des *Amis de la T.S.F.*, and the *Radio-Club de France*), president; Hemardinquer (S.F.E.T.S.F. and A.T.S.F.), secretary; Deloy (S.F.E.T.S.F. and A.T.S.F.); Givélet (R.C.F.); Jacquot (S.F.E.T.S.F. and A.T.S.F.); Le Mee (A.T.S.F.); Rousset (S.F.E.T.S.F. and A.T.S.F.); Waddington (S.F.E.T.S.F. and A.T.S.F.). The good wishes of General Ferrie, Inspector of the Military Telegraph Services, and the particular interest which he takes in the transatlantic tests for the study of short wave lengths, have afforded this committee the good fortune of the technical advice of Messrs. Jouaust, Mesney and Clavier, of the Military Telegraphic Laboratories.

The French committee has made an urgent appeal to all French amateurs for their participation, no matter how small their means of reception or transmission may seem to them. French transmission hopes center chiefly on 8AB, which has been completely rebuilt and now has three new towers and a 1 k.w. tube set using 25 cycles A.C. unrectified on the plate.

The commercial radio companies have displayed a very kind interest in our amateur activity and it is expected that their

high-powered stations at WII, New Brunswick, MUU, Carnarvon, Wales, and UFT, Saint-Assise, very possibly will broadcast reports of the reception in the respective countries. Details will be announced later in this country by amateur broadcast.

The British already are at work. At this writing we have just received a cablegram from Mr. W. W. Burnham of London advising of the reception on a Burndept-III 3-valve set as recently described in QST, of C.W. signals from U.S. stations 2ZK, 100 watt C.W. set at New Rochelle, N.Y., and 2HJ, Port Chester, N.Y., 150 watts. These stations were heard on Sunday morning Oct. 29th, in the Preliminaries, and the transmission has been verified. Mr. Burnham also reports signals from two uncertain stations whose call letters he believed to be 5VL and 9CT. We are unable to confirm these but are inclined to believe that they represent 5HL or 5JL, and 9CTE, all of whom have good C.W. sets and were on at the times in question, the 9 being heard on Oct. 31. Altho the exact identity may never be known, it shows that *the 5's and 9's are getting over!* Mr. Coursey further reports the reception in London of 2EL and 2AJL, verified, and Mr. W. R. Burne cables from Manchester the unverified reception of 1CX. We're going over big this year, fellows. Possibly our success will be so great that at the conclusion of the tests the Traffic Manager will arrange for direct two-way communication between the most successful American station and the leading contender in Europe, with our respective countries maintaining quiet and listening in, while, for the first time in history, amateur trans-ocean operation takes place!

To do these things requires a very full measure of co-operation, and every reader is now asked to turn to our Editorial section and carefully study the message of the month.

K.B.W.

The Transatlantic Finals

By F. H. Schnell, Traffic Manager

FOR the purpose of getting you started right on the Final Transatlantic Tests, which are given in Greenwich Mean Time (G.M.T.), we present some examples of your local standard time converted to G.M.T. and we urge a careful study of these examples that every one will understand exactly what must be done to avoid possible confusion. An explanation of G.M.T. appeared in October QST, page 42, and no further details will be given here.

You should, without the slightest difficulty, be able to convert your local standard time to G.M.T. from the following table.

*The midnight referred to may be the beginning of December 12th in England while in the U. S. or Canada it is still December 11th, according to our local standard time. Therefore, we suggest that you take a spare clock and move it ahead 5 hours if you use E.S.T., 6 hours for C.S.T., 7 hours for M.S.T., and 8 hours for P.S.T. Be governed by this clock and remember that a new day begins at MIDNIGHT, G.M.T. All tests will start at Midnight G.M.T. which is 7:00 P.M. Eastern Standard Time. For Example: Midnight to 0015 G.M.T. of December 12th is the same as 7:00 P.M. to 7:15 P.M. December 11th E.S.T. Since

G.M.T.	E.S.T.	C.S.T.	M.S.T.	P.S.T.
*Midnight	7:00 P.M.	6:00 P.M.	5:00 P.M.	4:00 P.M.
0100	8:00 P.M.	7:00 P.M.	6:00 P.M.	5:00 P.M.
0200	9:00 P.M.	8:00 P.M.	7:00 P.M.	6:00 P.M.
0300	10:00 P.M.	9:00 P.M.	8:00 P.M.	7:00 P.M.
0400	11:00 P.M.	10:00 P.M.	9:00 P.M.	8:00 P.M.
0500	Midnight	11:00 P.M.	10:00 P.M.	9:00 P.M.
0600	1:00 A.M.	Midnight	11:00 P.M.	10:00 P.M.

most of our tests are carried on between Midnight and 0600 G.M.T. we point out that there is no A.M. or P.M. in G.M.T. Up to 1200 G.M.T. (noon) the hours are reckoned as such but instead of writing one o'clock as 1:00 P.M., it is expressed as 1⁰⁰0 G.M.T. 3:14 P.M. would be written 1514 G.M.T., etc.

QRO First Ten Days QRO

Six hours, from midnight to 0600 G.M.T., have been divided into two periods; the first, midnight to 0230 G.M.T., for the "free-for-all," and the second, 0230 to 0600 G.M.T., for the individual transmitters who qualified for the final tests by covering a distance of 1200 air-line miles or greater in the preliminary tests, Oct. 25th to November 3rd.

WII on 13,600 meters at 0700 G.M.T. to be on the safe side, as MUU is rather hard to copy through the other high-powered stations. This has been arranged for through the kindness of Mr. W. A. Winterbottom, Traffic Manager of the Radio Corporation of America.

France will report result of reception of American and Canadian amateur signals each day at 0710 G.M.T. (2:10 A.M. E.S.T.) via UFT on 14,300 meters which will be repeated back by WSO on 11,500 meters.

An alphabetical code has been arranged which will be used in reporting call letters of stations heard. This code is given for the benefit of all amateurs. The French code is given also, which may be used because of the better understanding of it by

TRANS-ATLANTIC TESTS

Free-for-all schedule of American and Canadian amateur transmitters.

TIME	Tues. 12th	Wed. 13th	Thurs. 14th	Fri. 15th	Sat. 16th	Sun. 17th	Mon. 18th	Tues. 19th	Wed. 20th	Thurs. 21st
Mid-0015	C	1	2	3	4	5	6	7	8	9
0015-0030	1	2	3	4	5	6	7	8	9	C
0030-0045	2	3	4	5	6	7	8	9	C	1
0045-0100	3	4	5	6	7	8	9	C	1	2
0100-0115	4	5	6	7	8	9	C	1	2	3
0115-0130	5	6	7	8	9	C	1	2	3	4
0130-0145	6	7	8	9	C	1	2	3	4	5
0145-0200	7	8	9	C	1	2	3	4	5	6
0200-0215	8	9	C	1	2	3	4	5	6	7
0215-0230	9	C	1	2	3	4	5	6	7	8

Time shown in Greenwich Mean Time. Dates shown are in December, 1922. Numerals indicate radio inspection districts, the letter "C" standing for all Canadian Amateurs, who for the purpose of these tests are grouped as one district.

The procedure will take the form of a call address to "Test," calling three times and signing three times, repeating as often as necessary or desired during the period of time assigned to each district. Example: TEST TEST TEST de 6ZX 6ZX 6ZX.

Every licensed American and Canadian amateur transmitter is invited to participate in these tests. Regular League traffic shall be carried on without interruption or fear of jamming other stations.

English stations will report back to us through MUU on 14,200 meters, Carnarvon, Wales, at 0700 G.M.T. (2:00 A.M. E.S.T.) which report will be re-transmitted by WII on 13,600 meters, New Brunswick, N. J., a minute or two later. Listen for

French amateurs. Thus it will be seen that in American and English code, 6ZAC would be transmitted SIX ZED ABLE CAST; in French code, SIX ZOE ANDRE CAMILLE.

QRT Last Ten Days QRX

We hope it will be unnecessary to make individual request of any amateur, A.R.R.L. member or not, to keep his transmitter absolutely silent during the last ten days of the tests, December 22nd to 31st, inclusive, midnight to 0600 G.M.T., when we listen for French and English amateurs. In the name of good sportsmanship we ask every American and Canadian amateur to QRT during our reception periods. We want an absolutely silent air—100% so. (See editorial pages, this issue.)

Alphabetical Code

AMERICAN and ENGLISH

A—Able	N—Nan
B—Boy	O—Oboe
C—Cast	P—Pup
D—Dog	Q—Quack
E—Easy	R—Ram
F—Fox	S—Sail
G—George	T—Tare
H—Have	U—Unit
I—Item	V—Vice
J—Jug	W—Watch
K—King	X—Xray
L—Love	Y—Yoke
M—Mike	Z—Zed

FRENCH

A—Andre	N—Noemi
B—Berthe	O—Octave
C—Camille	P—Pierre
D—Denise	Q—Quimper
E—Emile	R—Rene
F—Francois	S—Suzanne
G—Georges	T—Therese
H—Henri	U—Ursule
I—Irene	V—Victor
J—Jeanne	W—Wagon
K—Kepi	X—Xavier
L—Louis	Y—Yvonne
M—Marie	Z—Zoe

Because of the limited number of transmitters in France and England, two periods have been set aside for their transmission. Each period is of three hours duration, one for France and one for England, alternating each night. At this writing the wave lengths of the European transmitters are not known, but this information will be broadcasted by our amateur stations in due time. We believe a wave length of 180 to 200 meters or thereabouts will be used, with a possibility of 440 meters in one or two instances.

We do not care to know the call letters or code letters of any transmitting stations, although a copy of call letters and code words will be kept under seal at A.R.R.L. Headquarters for verification of any reception by any American or Canadian amateur, who is requested to report his reception by wire (night letter) to A.R.R.L. Headquarters immediately after the conclusion of the tests each night. Upon verification of such report WII will transmit a message to England and France at 2000 G.M.T. (3:00 P.M. E.S.T.) using the American and English alphabetical code. 2FZ, England, would be sent TWO FOX ZED.

The schedule of English and French Amateur transmission periods is given in the table at the bottom of this page, in which "E" represents British amateurs and "F" the French amateurs.

Summary

Following is a summary of the foregoing:

December 4th to 9th, amateur broadcasting of wave lengths to be used by English and French stations and other information received too late for this issue of QST.

December 12th to 21st, from midnight to 0230 G.M.T., "free-for-all" transmissions.

December 12th to 21st, from 0230 to 0600 G.M.T., individual transmitters.

December 13th to 22nd, 0700 G.M.T.,—MUU on 14,200 meters and WII on 13,600 meters broadcast results of English reception of American and Canadian amateur signals.

December 22nd to 31st, from midnight to 0600 G.M.T.,—All U. S. and Canadian amateur transmitters QRT and QRX for reception of English and French signals, and report daily to A.R.R.L. Headquarters results of any reception for verification.

December 22nd to 31st, 2000 G.M.T.,—WII on 13,600 meters will transmit results of our reception to England and France, which will be repeated back by MUU on 14,200 meters.

Schedules of French and English Amateur transmitters—A.R.R.L.
Trans-Atlantic Tests, December 22-31, 1922.

	Fri. Dec. 22	Sat. Dec. 23	Sun. Dec. 24	Mon. Dec. 25	Tues. Dec. 26	Wed. Dec. 27	Thur. Dec. 28	Fri. Dec. 29	Sat. Dec. 30	Sun. Dec. 31
Mid. To 0300	E	F	E	F	E	F	E	F	E	F
0300 To 0600	F	E	F	E	F	E	F	E	F	E

"E" represents English Amateurs.

"F" represents French Amateurs.

Time—Greenwich Mean Time.

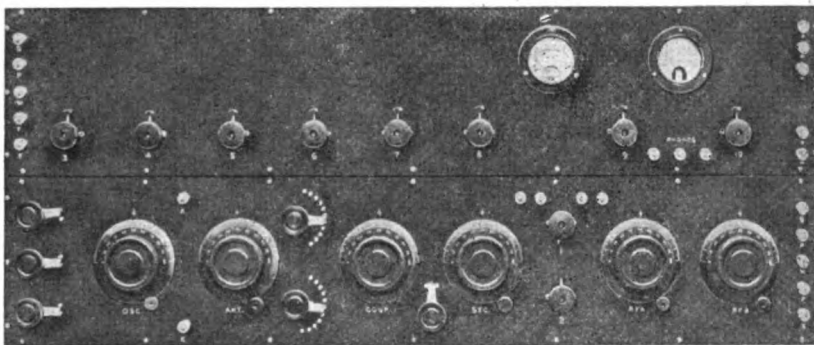
Notes on a Super-Heterodyne

By C. R. Leutz

DURING the past five years considerable expert engineering effort has been directed towards finding an efficient and satisfactory method of amplifying radio frequency energy at short wave-lengths. A glance at the characteristic curves of the present available detector tubes will show that a very weak signal cannot be rectified efficiently or completely, and in view of this point additional audio frequency amplification would not be of assistance. All detector or rectifier characteristic curves indicate that the resultant audio frequency current is approximately proportional to the square of the impressed radio frequency voltage. Therefore, the efficiency of the detector decreases rapidly with decrease of signal until a stage is reached at which the detector almost ceases to function.

special tubes with a view to reducing the internal capacity by special design, and they have designed special transformers; but the efficient results in each case have been confined to a narrow band of wave-lengths, for example 300 to 700 meters. Any attempt to increase the effective working wave-length band, particularly toward lower waves, has resulted in failure. It is obvious that if the receiver is to have a commercial value a range of wave-lengths from say 100 to 850 meters must be available with a minimum amount of adjustments and with uniform efficiency over the entire wave-length range.

In December, 1919, Major E. H. Armstrong gave publicity to an indirect method of obtaining short wave amplification, called the Super-Heterodyne. The idea is to reduce the incoming frequency which



Front View of the Completed Set

Many types of amplifiers have been devised to magnify the radio frequency energy before applying same to the detector and many have worked very well on long wave-lengths, with either resistance, inductance or capacity couplings. However, most attempts to use the same method of coupling for extremely high frequencies corresponding to wave-lengths of 50 to 200 meters have been complete failures. There is a good reason for this: the low capacity reactance existing between the structural elements of the amplifying tubes acts as a short circuit around the coupling medium, and prevents a difference of potential being transferred to the next tube. This short circuit can be eliminated by tuning with a parallel inductance but this leads to difficulties in the form of complicated adjustments and local oscillations. The French and English have constructed

may be, say 1,500,000 cycles (200 meters), to some suitable super-audible frequency which can be amplified efficiently, then passing this current thru a radio frequency amplifier and finally rectifying and carrying on to one or two stages of audio frequency amplification if desired. Transformation of the incoming signal frequency to the amplifier frequency is usually accomplished by a heterodyne oscillator and rectifier.

This action can be readily understood by referring to the wiring diagram. The primary circuit, C-1 L-1 L-2, is tuned in resonance to the incoming signal frequency, say, 1,500,000 cycles. The secondary circuit, L-5 L-6 L-7 and C-3, is tuned to resonance to the incoming signal frequency, coupling between these two circuits being adjusted between L-2 and L-5. V-2 is a rectifier or usual detector tube and V-1 with the associated parts is an external

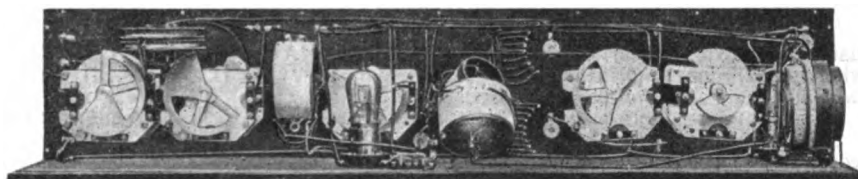
heterodyne oscillator. V-3 to V-8 is a resistance coupled radio frequency amplifier designed to operate efficiently at a frequency of 100,000 cycles, corresponding to 3,000 meters, the last stage of this amplifier (V-8) also acting as a detector-rectifier. The amplifier on the input side is coupled to the first detector by the tuned circuits C-4 L-8, and C-5 L-9, and on the output side to the detector and audio-frequency amplifier tubes. L-7 is in inductive relation to L-4 of the heterodyne oscillator.

Now assume that the heterodyne oscillator is tuned to 1,400,000 cycles or 1,600,000 cycles; either position will produce a beat frequency of 100,000 cycles with respect to an incoming 200-meter signal. The combined currents of 1,500,000 cycles and 1,400,000 cycles (or 1,600,000) are then rectified by the detector V-2 to produce in circuit (C-4 L-8) a direct current with a superimposed 100,000-cycle component. This

rents are 180° out of phase or in phase, a minimum when 90° out of phase.

In ordinary heterodyning the initial phase difference will vary for each wave train from spark transmitters, as the initial phase difference depends on the sparking at the transmitter. The frequency of the two currents are practically the same, and the length of the wave-train is small compared with the time required to form a complete beat at audible frequencies. Different wave trains are therefore rectified with different degrees of efficiency and the plate current becomes irregular, resulting in a rough note. However, the beat frequency is high in the super-heterodyne, several beats per wave-train being established, and the phase angle between the two currents changes thru a number of cycles and the initial phase difference need no longer be considered.

The adjustments for I.C.W. and telephony are a combination of the previous



Rear View of the Tuner

100,000-cycle component is then amplified by V-3, V-4, V-5, V-6, V-7, and rectified by V-8, and the resultant audio frequency note amplified by the audio amplifying tubes V-9 and V-10. In the case of continuous wave reception, the best method of obtaining the audible note in the phones is to employ a second heterodyne adjustable to 1,000 cycles on either side of the amplifier frequency of 90,000 to 101,000 cycles, and loosely couple this to the amplifier circuit. It is also possible to receive continuous wave signals by producing oscillations in the amplifier, of a slightly higher or lower frequency than the amplifier tuned transformer wave-lengths. Oscillation and also regenerative amplification can be controlled by the special condenser C-18. This special condenser obviously must have a very small minimum capacity or it will be difficult to stop the amplifier from oscillating.

On this set reception of spark and telephone signals can be carried on with equal efficiency and without any distortion, which is odd inasmuch as heterodyning a spark or telephone signal with an ordinary regenerative receiver will result in loss of note or tone. The efficiency of rectification of the incoming signal when heterodyning depends upon the phase relation with the local current. The efficiency of the rectification is a maximum when the two cur-

mentioned adjustments for spark and C.W. reception, bearing in mind that the amplifier circuits should be damped slightly to prevent distortion.

The present equipment being used is shown schematically in the wiring diagram and actually in the photographs. The radio frequency amplifier circuit is designed for 3,000 meters. Special attention has been paid to the effective design of the receiver circuits. L-2 and L-5 consist of a 180° coupler and give a 180° scale movement to a 90° coil relation. The condenser C-3 has shaped plates to give a straight line wave-length variation. The maximum capacity of this condenser is very low and the values of inductance large in order to develop the largest possible potential on the detector grid. In view of the fact that a loud signal is produced with only a fraction of a volt on the detector grid, the ratio of L to C is important. To keep the high frequency resistance low, the coils are designed to have very low values of distributed capacity and the condensers are of special design having only $1/10$ the resistance of the ordinary condensers. The inductance L-5 is used in parallel to C-3 to give the first wave-length range of 150 to 450 meters, and L-6 is connected in series to L-5 and both in parallel to C-3 for the second range of 310 to 850 meters.

As the mechanical distance between L-8 dyne V-1 are not used of course for long wave reception.

Material increases in signal audibility can be had by inserting a variometer in the detector plate lead, at post 6, 6, tuning the plate for regenerative amplification. In place of tuning the plate it is also possible to provide inductive coupling between the plate and grid of the detector V-2 in the usual manner.

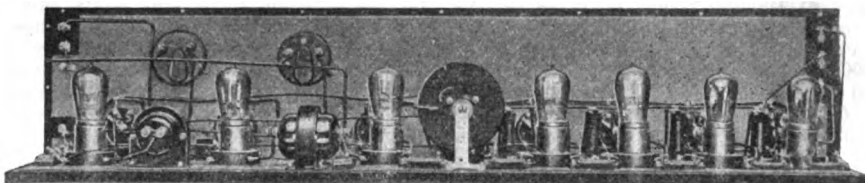
The results obtained with this unit have been very satisfactory. The antenna used was 125 feet long and fifty feet high located in New York City. On 600 meters, spark signals from NGE (Miami) NAU (San Juan) NAR (Key West) NAW

to adjust the characteristic curves to a point where maximum amplification is obtained without chance of the amplifier oscillating. The complete equipment is built in two units each entirely shielded with 10-oz. copper. The phone cords are also shielded with Belden Braid. The shields are connected to the negative side of the filament battery.

To use a loop the links are taken out at posts 8 and 7 and loop inserted there, using C-3 to tune. For long wave reception, a large inductance is connected in place of L-9 for the secondary and that coupled to the antenna, the resistance-coupled amplifier then working direct as a R.F.A. without the heterodyne, in which work it operates well down to 850 meters. The long wave reception would not be possible if a tuned radio-frequency amplifier were employed. The first rectifier V-2 and hetero-

(Cuba) NAP (Pensacola) NAO (New Orleans) VCE (Cape Race) and ships around the Canal Zone were received with sufficient audibility to be heard fifty feet from the telephones. On 360 meters radio-phone signals from KYW (Chicago) WOC (Davenport) WWJ (Detroit) WHB (Kansas City) WSB (Atlanta) WHA (Wisconsin) were received with the same signal audibility. On 200 meters, a continuous stream of 8th, 9th, 4th and 5th district amateurs were heard. All these results were obtained in the late summer with unusual heavy static conditions.

[These data, photographs and drawings of this design were supplied thru the courtesy of the Experimenters Information Service of 220 West 42nd Street, New York, who have available for distribution complete sets of blueprints covering the entire construction of this equipment.—Ed.]



Rear View of the Amplifier

core; where the coils would have zero resistance and the iron would be free from losses. Obviously these ideal conditions can not be realized in practice; but that a well designed transformer approaches very closely to the ideal is evidenced by the fact that large transformers often test up to 99 per cent. efficiency.

Neglecting the very low resistance of the primary coil, the only opposition to the flow

“Notes on the Design of Small C. W. Transformers”

By A. H. Babcock, 6ZAF

UNDER this caption, there was printed in the July issue, p. 29, an article that calls for more extended notice. The theory of the action of small C.W. transformers is so simple that there is no excuse whatever for any misunderstanding of this subject.

The ideal transformer would consist of one or more coils of wire surrounding or partially embedded in a laminated iron

core; where the coils would have zero resistance and the iron would be free from losses. Obviously these ideal conditions can not be realized in practice; but that a well designed transformer approaches very closely to the ideal is evidenced by the fact that large transformers often test up to 99 per cent. efficiency.

Neglecting the very low resistance of the primary coil, the only opposition to the flow

of current is the reacting electro-motive force induced in the primary coil by the rapid reversals of the magnetization of the core, which are due to the alternations of the supply current.

When the secondary coil is open, just enough primary current flows to produce the magnetization necessary to generate a reacting e.m.f. equal and opposite to the voltage of the supply circuit. This is called the magnetizing current. When the secondary coil is closed, an additional current, called the load current, flows in the primary coil. The magnetizing effect of this load current is exactly equal and opposite to that of the secondary current; hence under all conditions the combined magnetizing action of the primary and secondary coils produces just that magnetization of the core which will make the reacting e.m.f. of the primary coil equal to the voltage of the supply circuit to which the primary of the transformer is connected.

Evidently then the first step in transformer design is to determine the primary turns necessary to generate an e.m.f. equal to the supply circuit voltage; and then to determine what the primary current will be so that the proper size wire may be used in the primary coil, and thus prevent excessive heating. The fundamental equation for any transformer or reactive coil is:

- Let E = the induced e.m.f. in volts.
 F = the total magnetic flux.
 B = the lines of force per square inch.
 A = the cross section of the magnetic circuit in square inches.
 N = the cycles per second.
 T = the number of turns of the primary coil.

Then:

$$E = \frac{4.44 N F T}{100,000,000},$$

which is the most important formula used in the design of transformers.

The next step is to determine the total flux. Long experience shows that if we assume 50,000 lines per square inch for the ordinary iron used in the design of small 60-cycle transformers, we will be on safe ground. Then.

$F = 50,000 \times A$, and for a 60 cycle circuit $N = 60$

Substituting these values in the fundamental equation we have

$$E = \frac{4.44 \times 60 \times 50,000 \times A T}{100,000,000},$$

from which

$$E = \frac{A T}{7.5};$$

therefore, for any given primary voltage, the product of the number of square inches

cross section of the iron and the number of turns, is always the same. Evidently, then, we may make the number of turns large, and have a small core; or if the core is made large, the number of turns becomes small. In the first case it means more work winding on a lot of turns; and more expense, because copper wire, especially in small sizes, is more expensive than iron.

For a practical application, let us assume we have a core on which we wish to wind a primary coil for a 115 volt supply circuit; and that the core cross-section measures 10 square inches. Transposing the simplified equation gives us now

$$T = 7.5 \times \frac{E}{A},$$

which says that for a transformer to be used on a 60-cycle supply circuit, the primary turns are found by multiplying the supply circuit voltage by 7.5 and dividing the product by the number of square inches of the cross section of the transformer core, measured at right angles to the laminations, and at the part of the core that is enclosed by the coil. By substituting, we now have

$$T = \frac{7.5 \times 115}{10},$$

and our primary coil then has 86 turns.

The next question is what size of wire to use. To determine this it is necessary to decide upon the capacity of the transformer. Let us assume that the load will be two U.V.203 tubes, both plate and filament. Then the plate circuit will require $2 \times 1000 \times 0.15 = 300$ watts; the filaments $2 \times 12 \times 6.5 = 156$ watts, allow for transformer losses 44 watts, and the primary coil input becomes 500 watts;

from which the primary current is seen to be 4.35 amperes. If we allow 1500 circular mils per ampere (which is a safe allowance), the wire must be 6500 circular mils, which is #12 B&S.

The proper number of turns for the other coils may be determined directly from the primary turns, as follows. Since the primary voltage is 115 and the number of turns 86, the volts per turn is equal to $115/86$ or 1.337, and the volts per turn is the same for all coils of any given transformer. Hence, to compute the number of turns for any other coil, divide the volts of that coil by the volts per turn: for example, the plate circuit e.m.f. is 1000 volts and $1000/1.337 = 748$. The filament circuit e.m.f. is 12 volts and $12/1.337 = 9$.

The plate current is 0.15 amperes per tube or 0.3 if the tubes are in multiple, and the circular mils $= 1500 \times 0.3$ or 450, the nearest largest size wire being #23.

The filament current is 6.5 amperes per tube or 13 if the tubes are in multiple, and the c.m.=1500 x 13 or 19,500, the nearest commercial size to which is #6. If the filament coil were wound in a single layer, outside the other coils, it would be perfectly safe to use #8 B&S.

All the foregoing has been based on the assumption that a core was available. Now let us determine what to do when we have no core, but expect to cut up some sheet iron and make a core.

By transposing our original simplified equation we obtain

$$A = 7.5 \times \frac{E}{T},$$

which says that the area of cross section of the core required is equal to 7.5 times the volts per turn. If the volts per turn are about 1 to 1.5 the number of turns will be about right. Then for a good, safe and convenient design, the area required will be between $7\frac{1}{2}$ and 11 square inches.

Caution: Be sure to cut your plates long enough and space the legs of the core wide enough apart so that the coils and their insulation can be placed in position.

The same equations can be used for other frequencies by changing the 7.5 to 12 for 25 cycles, and to 9 for 50 cycles.

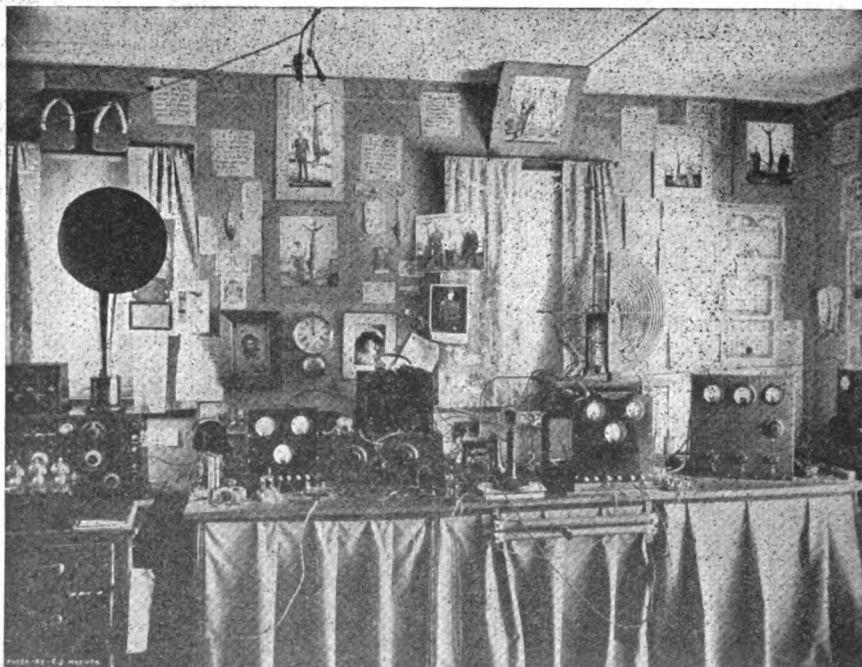
Some More Records

6XAD, the experimental station of Major Lawrence Mott, O.R.C., Signal Corps, at Avalon, Catalina Island, Calif., has added new laurels unto itself, in that its C.W. signals have been heard by engineers of the Amalgamated Wireless, Limited, in Australasia. The headquarters of this company are in Sydney, Australia, and they are in daily communication with Carnarvon, Wales. Major Mott intends a series of tests with

the engineers of the Australian station during the coming winter, arrangements having been made to this end.

This distance appears to be roughly 6,600 miles, which to the best of our belief is the world's amateur long-distance transmission record.

6XAD continues to do the remarkable work for which we gave it credit in our columns recently. Really it is amazing how this one station reaches out into places



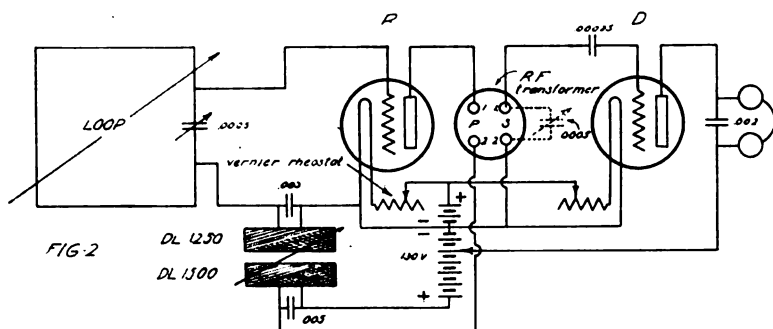
The Operating Table at 6MOTT

frequency by varying the coupling between the two honeycombs. In fact the writer prefers the inductively coupled circuit to the capacity coupled one inasmuch as the latter is not as flexible as the former. The coupling adjustment between the honeycombs is, however, quite critical but it can readily be handled if a vernier control is provided.

To those unfamiliar with the action of a super-regenerative circuit it may be well to give a few hints on its operation. After the set has been connected as per Fig. 1, it is best to determine first whether the high frequency circuit will oscillate. To do this remove the DL-1250 from its mounting; leave everything else connected as shown in the figure. The two variable condensers should be turned thru their scale length to determine at what settings of the condensers the plate and grid circuits are in resonance. This procedure is the same as on a tuned-plate regenerator, so no difficul-

With the set connected as shown in Fig. 1 and adjusted for C.W. reception, the writer had no difficulty in raising a station two blocks away. Signals were reported as QSA. The other station's oscillating receiver could be plainly heard while the test was being carried out. So it is apparent that we may still experience interference from nearby receivers even tho loops are used. Furthermore the experiment helps to show why it is possible to receive C.W. with the super circuit. It must be remembered, however, that the coupling between the honeycombs must not be reduced any more than is absolutely necessary to heterodyne the C.W. By the use of a vernier rheostat in the filament circuit of R, the proper adjustment for C.W. may be more readily attained.

For those who want substantial proof that the super works for DX reception, a list of calls heard in about five days of listening, is given herewith:



ty should be experienced from this source. To determine whether the low-frequency circuit will oscillate, insert the DL-1250 in its mounting and couple the honeycombs closely. If a high pitched squeal is not heard, reverse the connections to one of the honeycombs. This should correct the trouble. Once the low-frequency circuit is oscillating you are ready for business. Adjust the two variable condensers to settings that you know bring the plate and grid circuits to resonance. Decrease the coupling between the honeycombs slowly. As this is done a point will be reached where a hissing sound is heard in the phones (similar to the sound in an ordinary regenerator when the latter approaches the oscillating point). Just below where this hiss becomes a roar, is the best adjustment for fone, QSA I.C.W. and spark, altho the latter comes in very badly distorted. For C.W. and QRZ I.C.W., the coupling between the honeycombs is reduced so as to pass the point where the roar occurs. When this is done, the high and low frequency circuits both oscillate at once. This fact was proven in an experiment conducted by the writer.

1AEU, 1AJP, 1AJU, 1AZU, 1BKQ, 1BUT, 1CCZ, 1CHJ, 1CMP, 1CPN, 1ES, 1FB, 1II, 1VY, 1XP, 3ALN, 3APR, 3AT, 3BGT, 3BHM, 3BIT, 3BNU, 3BUP, 3BVL, 3BZ, 3CA, 3CBN, 3EM, 3HG, 3LP, 3MH, 3MK, 3TJ, 3ZO, 3ZU, 3ZZ, 4BX, 4DC, 4EA, 4FT, 4GH, 8AB, 8ADR, 8ADH, 8AFD, 8AHR, 8AIO, 8ALT, 8ATU, 8AQO, 8AWY, 8BDB, 8BPH, 8BVR, 8BXH, 8CUR, 8DAK, 8OW, 8SB, 8SP, 8UE, 8UC, 8WR, 8ZZ, 9ARA, 9BYA, 9EI, 9II.

Fig. 2 shows an interesting circuit developed from Fig. 1. It will be seen that a radio frequency transformer is substituted for the two inductances shown in Fig. 1. The idea in substituting the R. F. transformer was to try to get rid of the tuned plate circuit of the first tube (one variable adjustment) and at the same time avoid the use of a tickler. It was found necessary, however, in order to cover wave-lengths from 180 to 360 meters to shunt a variable condenser across the secondary of the transformer as shown by the dotted lines. The introduction of this variable adjustment of course counteracted the advantage of eliminating the tuned plate of the first tube.

The circuit has possibilities, however, as a wave-length band of about 50 meters can be covered without adjusting the condenser across the secondary. The writer suggests that someone try a transformer with looser coupling between the primary and secondary.

Signals were nearly as QSA on this arrangement as on the set described above. The control is of course very simple there being only two controls over a rather broad wave-length band. The writer advises the trying of the circuit in Fig. 1 first, inasmuch as it is quite simple and can usually be relied upon to work. Fig. 2 should only be tried after the action of the super-regenerator is more clearly understood.

The circuit shown in Fig. 4 of July QST was tried but it did not come up to ex-

pectations. First of all, every time a variable element is adjusted it sounds as tho 14 different heterodynes are going at once, and secondly it is very critical. The locally-generated beats drown out all weak signals. The circuits shown in Figs. 3 and 4 of September QST were also tried. Fig 3 is OK but the squeal of the variation frequency makes the reception of weak signals difficult. Fig. 4 is OK for 200 meter work but the writer was unable to obtain the super effect above 270 meters.

The writer did not try connecting a one-stage audio amplifier to the circuit shown in Fig. 1 but there is little doubt that it can be done, altho the writer can't see the use of audio amplifiers when signals nearly break the fone diaphragms when no audio stages are used.

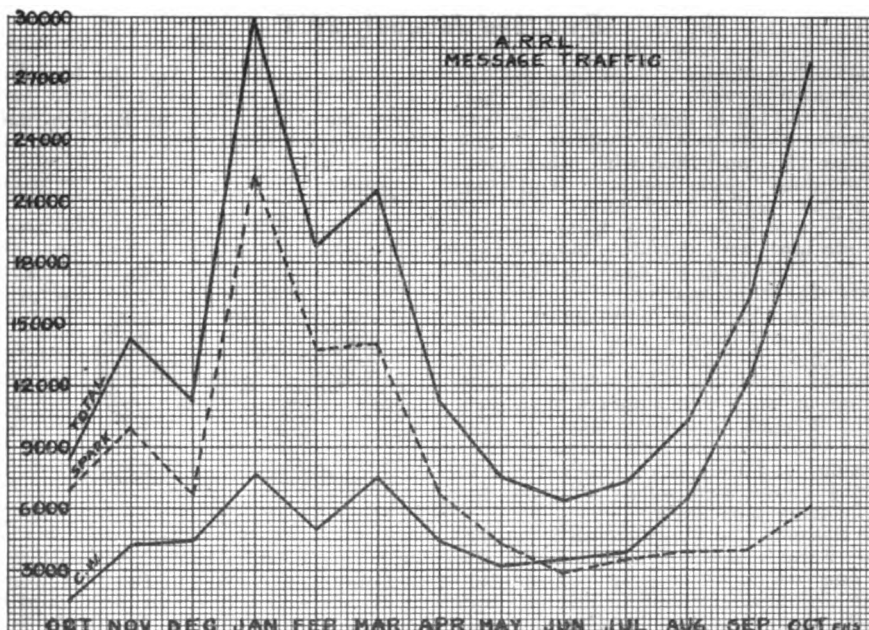
A. R. R. L. Message Traffic

By F. H. Schnell, Traffic Manager

ABOUT a year ago we thought it would be a good idea to know how many citizen messages we handled every month. It was in October, 1921, that as accurate count was started as could be obtained through the offices of the Division Managers of the number of stations handling traffic, on spark and C.W., and the total messages

handled in each division month by month. These data have since been gathered every month.

From these figures the accompanying curves were taken to show graphically just where we stand; also is shown the progress made by C.W. stations, which have out-classed the spark stations in message traffic handling.



The figures at the left indicate the number of messages handled. The months are from October, 1921, to October, 1922, the last being included to show the enormous increase in traffic over October, 1921. Total messages are represented by the heavy upper curve; spark, because of its damped wave, the dotted line of course; with C.W., the continuous wave transmitter, represented by the continuous curve.

The slump in traffic during December of last year is due to the fact that ten days of the best part of the month were given over to the Trans-Atlantic Tests when practically all message-handling was at a standstill. Except for this, no doubt the rise to the highest peak in January would have been a steady one from November.

The drop in February may be accounted for in several ways. Upon learning that C.W. stations were more successful than spark stations in the Transatlantic Tests, a great number of stations saw the possibilities of C.W. more pronounced and ceased operation with their spark stations, installing C.W. Then, too, came the overwhelming interest by the public and amateurs were inclined to abandon their regular work for fear of causing too much interference to the inexperienced listener.

March saw a gradual return to the game

with a decided increase over the previous month for C.W. traffic. April, as usual, came with the interest in radio overshadowed by the interest of the great outdoors, where almost every radio amateur spends his time in recuperating from the effects of a hard winter's work. That drop is to be expected every year when static again becomes King of the Ether. Had hundreds of radio dealers who decided to sell radio apparatus when the boom came, known or foreseen the summer season and bought accordingly, many of them would still be in business and those who are still here would not have most of their capital tied up in apparatus, which has been on their shelves for many months, hard to move.

Slowly, but steadily, C.W. has been dethroning the spark and in June the good old spark had to relinquish the honors to C.W. Youth will be served, even in radio. From June to the present month the spark has made a strong effort to come back, but those efforts have been brushed aside by the ever-rushing progressive C.W. stations to whose numbers many spark stations are converted every month.

The only question that remains is "How many months will it be before spark stations disappear entirely?"

Comment les Appeler?

(How shall we call them?)

By Lloyd Jacquet, 2KT

FRENCH amateurs are getting the unmistakable radio bug. Here they were tickled to death by getting into communication with fellows in the same city, and then with other hams in surrounding "departments." And even after a few really good hams, such as 8AB, 8AC, and a few more, have developed DX stations, they couldn't believe that they could ever reach England, or Holland, or Spain for that matter.

At present, there are only Dutch, English, Spanish and French amateurs to mussy up the ether of Europe. Imagine what will happen when the whole large family get going at once! It appears, however, that the French amateurs have so far been the champions in long distance communication, and they have reached out in all of the above mentioned countries, besides Germany, and Italy.

Now there is one thing which is worrying the French methodical and scientific mind, and which is causing considerable thought in amateur radio circles, and which, further, has caused their own amateur society to appoint a commission to

study the question. And the big question is this: How shall we tell who is who, when the Americans, the English, and the French are transmitting? In other words,



supposing 8AA in the U.S. is calling 20M in London, will 8AA in Paris answer 20M in N. J., U.S.A.???? Or will 20M, whoever he happens to be, be flatly insulted because 8AA won't give him a tumble?

There may arise international complications, which these diplomatic French amateurs are anxious to avoid from the beginning. Now, they have suggested a very sensible answer to the problem.

They have looked over the method used by American and Canadian operators, to distinguish between communications from either kind of stations, and frankly, they do not like it. It is done this way, as many of us know: American stations use the word "de" between their call and the station called, if working in their own country. If they are in communication with a Canadian station, they will say "aa" and in answer will get "fm." Canadian stations working between themselves use a "v." Don't you see the number of various signs that would have to be made up to accommodate all of the amateurs in the world? You would need a regular text book on "transmitting etiquette," besides your book on rules and regulations and the call book.

But here is what the S.A.T.S.F. has to say about that. Let the amateurs in each country use the initial of the name of their country, to precede their call, when they are calling a foreign station. Thus, U.S. stations could prefix their call letters with the letter "A" for America, the French "F," the English "E," the Canadians "C," the Dutch "H," the Spaniards "S," and so on. Thus, if you heard stations A1BKQ de F8AB, you would know that 1BKQ in the U.S. was being called by 8AB in France. This would not in anyway affect the official call letters, and would provide a method of determining exactly what station was called.

Besides, the French believe that it could be possible to take all of the amateur calls, pool them together, and do exactly what the nations did at the London Convention: allot certain numbers and series to various countries. This would mean the calling of an International Amateur Congress, and the complete reassignment of all call letters the world over. Thus, all of the call letters which could be had by combinations including 1AAA and 9ZZZ, (which would amount to several hundred thousands) could be distributed to various countries very much in the same way that the letters of the alphabet were passed around to the various nations for commercial and military calls. This last method, though the best, is probably not the most practical, for it would certainly upset things here in the U.S., where everything would have to be done over again. Hundreds of thousands of records would have to be fixed over again, and many of us would not like to give up pet call letters, which we have possessed ever since there were radio inspectors.

Don't forget that the French amateur looks forward to international radio communication between amateurs of various countries as a certainty, and that he believes that it will come true and be a daily feat very shortly. He is anxious to get things straightened out from the beginning. And there is no use of us sitting back, and saying that we can't do anything about it. It is our place more than anyone else's, to see to it that radio amateur law is made and enforced. It is our duty to advise, point the way, and take the initiative.

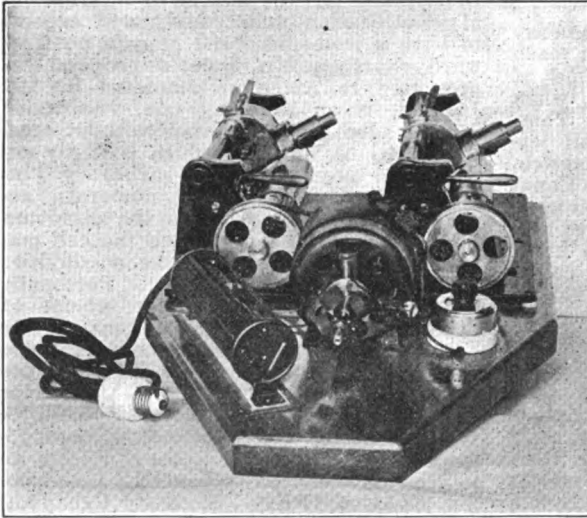
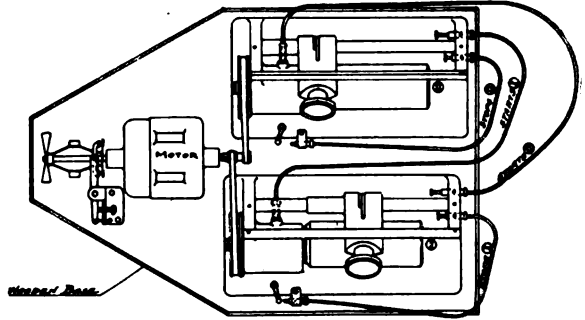
How about some suggestions from you lawyers? How about getting down to business, and preparing material for that first International Amateur Congress, which is just as sure to take place as the exchange of messages across the Atlantic and Pacific?

[Editor's Note: Our A.R.R.L. Operating Department has the matter of international identification under study and expects to have a well-considered plan to put forward shortly. Mr. Deloy's proposal, as presented to American amateurs by Mr. Jacquet, is an excellent one, one which can be adopted at any time without legal complications, and one which is vastly superior to any system of arbitrary "intermediates" made up of numerals, accented letters, etc. It has the disadvantage, however, of lengthening the call materially and of increasing the possibilities of misreading a faint signal. Personally we favor a somewhat similar scheme of using the initials of the nations *as the actual intermediate*. For example, suppose we let U represent the United States, use C for Canada, Q for Cuba, G for Great Britain, F for France, N for Holland, A for Argentina, etc. Then U.S. amateurs working each other will use "u" for an intermediate instead of "de," as, for example, 6ZAC u 1BKQ. Similarly Canadians might use "c": 3BP c 3GN; the Frenchmen "f": 8AA f 8AB; the British "g": 2FZ g 2JK. Then when stations of different nationalities are working, the intermediate can consist of a combination of the two national intermediates, *the called nationality first, followed by the national calling*, the same as the order in which the calls themselves are given. Thus, a U.S. station calling France might use "8AB fu 1BHW," and the reply would be "1BHW uf 8AB." By this process the nationality of all calls would be instantly discernible if one knew the countries for which the single letters stood. At the present time, however, international law prescribes the use of "de" and the permission of our respective governments probably would have to be got for the change. What do our readers think?—K.B.W.]

Recording Signals

THE Columbia Graphophone Co., makers of the "Dictaphone," etc., recently prepared an adaptation of their machines for use at the radio station of the "New York Times" for recording high-speed radiotelegraph signals which we understand has worked very successfully.

The Dictaphone is a device used in business establishments for recording office dictation of correspondence, etc., upon wax phonograph cylinders, the records being transcribed at leisure and at any desired speed by the typist. Two such dictating machines were arranged upon a common base as shown in our



illustrations and fitted with automatic stops whereby upon completely filling one cylinder the recording would automatically be switched to the other drum which meanwhile had had a fresh cylinder put upon it by the attendant, and so on.

The telephone receiver is attached direct to the speaker casting on the machine in place of a speaking tube, and accordingly the signals are recorded. The machine is run at a high speed of 150 or more r.p.m. for receiving, and then slowed down for transcribing by the typist who understands and reads the signals.

Now to rob some office having dictaphone equipment!

K.B.W.

Some C.W. Experiments and Results

By L. W. Hatry, 5XV

IT'S the Ed's fault, absotively, and ye may lay it to that! After that editorial of his in the August number of our gug-glorious organ, entitled "Your Pen in Hand" whose else could it be? Anyway, after reading that I decided that even my dope ought to get across with such a dearth of material. So—but enuf foolishness—to biz—

If you have a high powered C.W. set

(anything over 5 watts) this article will most likely not be of interest to you so pass it up; but the bird with a fiver or with the intentions of putting one up will find this of some help—perhaps.

Notice Fig. 1 (professional touch, eh, wot?) In starting out with my C.W. experiments I used a W. E. "J" tube as the power tube. Now among other things I wanted to use as little material to make

this set as possible, hence the very elementary arrangement in Fig. 1. I did not want to buy a grid tuning condenser so I made the grid inductance have 42 turns and seemed to hit it right. Using B batteries on the plate with a voltage of 250 I obtained 0.3 amp. antenna current and worked 5JB at Hot Springs, Ark., and 5ZAT at Oklahoma City, Okla. Both distances are over 300 miles and were done in June with heavy QRN prevailing. This communication was overheard by 9AIY in Milwaukee, which of course is a consider-

coupling till set just oscillates or just quits and then retune grid tuning condenser for best antenna current, with a final adjustment of the grid-plate coupling.

The next thing I did was to try the hookup in Fig. 3 to see if it was better than the one in Fig. 2 and can say that if my meter didn't lie then Fig. 3 cost about .2 amp., as it brought my antenna current down to .6 with A.C. plate voltage.

And the next thing I tried out was the arrangement of Fig. 4, hoping to see my meter show a raise in radiation. It did

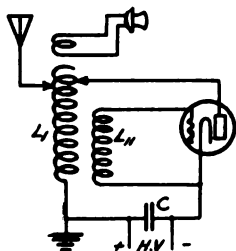


FIG 1

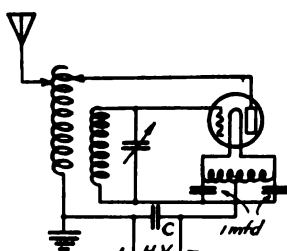


FIG 2

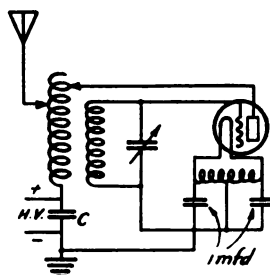


FIG 3

ably greater distance. Daily work with Galveston and Houston, 65 to 85 miles, was done regularly at any time. Radiation did not seem to change any with an increase of wave-length to 250 meters. Also with this arrangement there is not a very critical point for the plate adjustment on L' . L' is 25 turns of 7x22 bare copper aerial wire on a 4" form. Using the shorted turn method of modulation I was heard faintly in Galveston on voice in the daylight—I did not try the fone at night, QRN being too heavy.

My next step was using the circuit in Fig. 2 and reducing my grid inductance to 32 turns to tune with the variable. I increased my wave-length to 275 meters approx., too. Despite what seems to be obvious changes for the better my radiation did not increase in the least. So I stuck in a U.V.202 instead of the J (the J quit anyway) and raised my antenna current to 0.5 amp. with 300v. plate batteries and .80 with 550 A.C. Again I experimented with both Figs. 1 and 2 with neither better than the other except that Fig. 1 is the more economical arrangement. With Fig. 2 the plate tap off L' is critical to the turn. In tuning, set the aerial clip, then set the plate clip same place and adjust the grid tuning condenser for best antenna current; then adjust the plate clip for best antenna current and follow up with loosening grid-plate

not, tho, and in considering this the fact that my set is only a 5-watt is, I believe, the whole reason. With a higher powered set an increase would show, no doubt. These things I found: that the r.f. chokes 1 and 2 are very critical; that is, No. 1 is, for No. 2 is absolutely useless and if No. 1 is out the set won't work. No 2 should be left out. I won't hazard a guess as to what use No. 2 would be in a higher

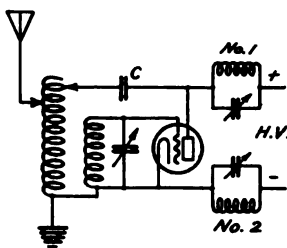


FIG. 4

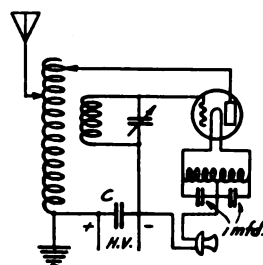


FIG. 5

powered set but I believe it would not be necessary. I found that the stopping condenser C has to be a husky with decent plates, as it has to carry a real current. At first I used a Somerville .002 1000v. tested C.W. condenser which only cost 60¢ and which is as good as the next for a bypass across the H. V. transformer as in Fig. 2, and ruined it. It did not puncture (its voltage rating is conservative at 1000v.) but it got so hot that it could

not be touched and melted the tinfoil used in it. So I stuck in a U.C.1014 which has a 2 amp. rating and had no further trouble. For the boy building his own I would say use glass and copper foil or plates, as it makes a good efficient condenser. As I said before, the condenser for a by-pass in Fig. 2, C, can be one of those Somerville paper ones and should be subjected to this treatment before using as it will avoid any chance of the condenser acting uppish; dip in melted paraffine until thoroly permeated and then squeeze flat and tight until cooled, when you will have a compact unvarying capacity with better insulation.

Another thing tried was the modulation method in Fig. 5 and it showed up better than the shorted-turn method with the same radiation and was reported much clearer. It requires a low-amp microphone. Also it is best not to use one of the microphones requiring 12 volts or more. In

fact the N-S or Skinderviken microfone buttons, mounted, work fine with it.

As a final touch it must be said that Fig. 1, simple as it is, is as good as the rest and costs the least. Build like this: L' 20 turns #14 wire at least, L" 40 turns #20 wire and inductively coupled to L' with coupling variable in any degree. L' is 4" diameter and L" 3 inches.

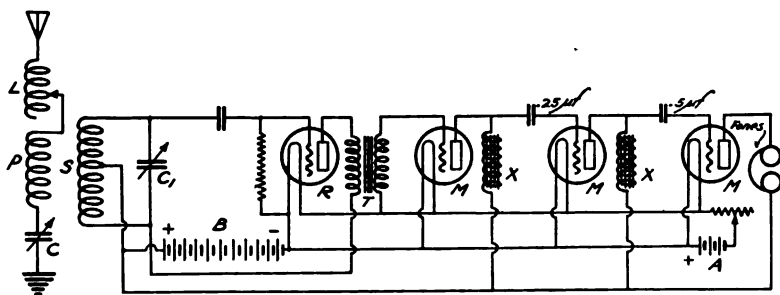
Oh yes, forgot to tell you. Aerial was originally a 4-wire flat-top with 3.3-foot separation of wires and cage lead-in. Changed to a 4-wire cage with 7 ft. cross pieces and cage lead in and my antenna current increased from .8 to 1.3. Went over old aerial for defects and found everything F.B. so use your own judgment. Me, I'm a booster for the cage now. And say, you birds putting up aersials, separate those wires wide. 5 ft. separation of wires in a cage is .1 amp better than 3 ft.

Darn, forgot again. A grid condenser and leak does not improve in any of the above cases on my set. S'long.

A French Amateur's Circuit

IN our May issue we reported the rather remarkable reception on Feb. 5th of the spark signals of station 1ARY in Paris on a regenerative detector and three stages of audio amplification. The French amateur, Mr. G. Perroux, used a one-wire aerial 35 ft. long stretched horizontally across the court of a building at a height of 5 ft. and had an oblique lead-in 65 ft. long slanting back upon the horizontal part, with this end of the aerial point

Mr. Perroux' is a real amateur station—one in which experiments are constantly going on and in which the apparatus in use hardly remains the same from one day to the next. The circuit diagram shows the hook-up used at the time 1ARY was copied. No radio-frequency amplification is used, but a regenerative detector and three stages of L.F. amplification in a circuit in which the reaction is controlled by unusual methods.



E.S.E. So unusual is such reception that we have waited eagerly for information on the equipment or methods used, in the belief that if they showed anything out of the ordinary the innovations possibly might be the reason for the performance and therefore worthy of careful study. We were not disappointed, for "La T.S.F. Moderne" recently contained a description of the set from which we abstract the following.

The antenna load coil, L, is a 3-inch cylinder 6 inches long, the winding having 10 taps, while the actual primary, P, is a basket-wound coil of 42 turns on a 2-inch center. The secondary, S, is a similar basket-weave of 31 turns on a 2½-inch center, tapped at the 16th turn. Fine tuning is accomplished by the air variable condensers, which have a maximum capacity of .0007 mfd. Very loose coupling is used.

between P and S, the usual separation being 8 to 10 inches.

There is nothing unusual about the amplifier, the first stage being transformer coupled and the remaining two reactance-capacity coupled, the reactances consisting of the secondaries of small spark coils.

The actual tuning of this apparatus is done in the ordinary manner but the method for obtaining and controlling the reaction is quite unusual. The secondary, S, has a center tap going to filament (via the B battery), and so acts like a heterodyne or oscillator coil, with half of its inductance in the grid circuit and the other in the plate circuit. Now normally this circuit would oscillate continually but the antenna-ground circuit acts as the secondary circuit of a miniature transmitter and extracts energy from the secondary circuit faster than it can be generated—if the coupling between P and S is tightened—so that the tube does not oscillate. By choos-

ing a convenient value of coupling, any desired condition may be obtained; the tube may be brot right to the limit of regeneration without oscillation, for the reception of damped or modulated signals, or it may be permitted to oscillate for heterodyne reception and the amplitude of oscillation will be controllable by the value of P/S coupling.

The operation of this system insures resonance between primary and secondary, for it is only at resonance that the control of the primary over the secondary will be evident; and resonance will be very sharply defined, with the sharpest of tuning. In fact this circuit should "balance out by clicks" in a manner that would delight the heart of old man Groves himself. There are many pretty possibilities in its use and we recommend it to our "circuit-hounds" who are looking for something promising to develop.

—K.B.W.

Saving your Neck

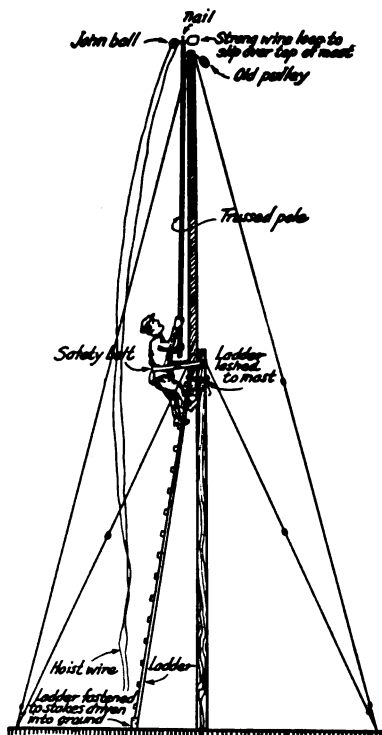
By Norman R. Hood, 7ZO

DURING the past year I have read of instances where at least three amateurs have been killed and more hurt shinning slim sixty-foot "two-by-four" masts to replace a broken aerial hoist rope. Why a hundred and seventy-five pound ham should take a notion to shin such sky-scrapers is more than we know, but they will do it and they will get hurt. In order to save some other ham's neck I am writing this, the method many broken ropes have been replaced at 7ZO and the final method in which broken ropes can happen no more.

Seeing the rope break from the pulley of a nice fifty-footer is as bad as four five-watters going west in parallel. As a general rule our masts are not any too sturdy and when a rope parts it is either shin the mast, risking our neck, or take the mast down and replace the rope and then the tremendous task of raising the mast again with our limited hoisting facilities. Several ropes have parted at various stations owned by the writer, but they part no more. The stranded wire clothes lines which can be had for less money than a rope of equal length would cost has solved the problem at 7ZO. Yes, the ohm chasers and high frequency bug hunters will say that wire hoist lines will reduce your overall aerial efficiency but is it not better to reduce this than to reduce yourself to a soggy mass at the base of a wrecked 2 x 4 mast?

Pulleys also come in for their share of grief. Wire ropes will invariably "climb" the wheel in a small pulley so the familiar

strain insulators with which we break up guy wires make excellent pulleys. They



are sometimes known as Johnny Balls. They offer a smooth-running surface for the wire rope, and no chance to get out. If the insulator breaks, your aerial remains up due to the fact that the wire to which the insulator is fastened is looped thru the hoist wire. This method has been used at 7ZO now for three years, the same set of Johnny-Ball pulleys, the same wire rope hoists, and the same set of masts have stood three bucking winters and look as tho they could remain three more winters. Before this method was taken several ropes were replaced in the following manner, the last one put up being the wire rope, and since then have forgotten about this side of amateur grief.

The masts at 7ZO are 4x4, being 48 feet high, about the average height of most of our masts. This method of replacing ropes is applicable to masts up to 50 feet in height, and higher according to the genius of the owner. A ladder is placed reaching up to the first section, which is 24 feet. The ladder is nailed to stakes driven into the earth at the base of the masts and then lashed to the mast at the top of the first section. A strong 25-foot

bamboo pole or a pole made from lattice strips trussed so as to be stout is used to push the pulley and rope to the top of the mast. A strong wire loop which will slip down over the top of the mast and catch on the old pulley is made, with the wire extending about a foot into which is tied the john-ball or strain insulator. The wire rope is then threaded thru the hole in the insulator. This is fastened to the top of the bamboo pole with a single nail driven in just far enough to hold good. Mount the ladder to the top of the first section. Strap the safety belt around you and the mast. Then hoist the pole towards the top of the mast, sliding it along one of the top guy wires to steady it. Raise it slowly over the top of the mast till the wire loop is exactly over the top of the mast and let it slide down the mast until it catches on the old pulley fastening, and then, with a quick jerk, pull the pole loose from the loop, the nail pulling out and the pole coming free; leaving the loop, the john-ball pulley and your new wire rope nicely set at the top of the mast. The old pulley will remain dangling at the mast head, a beaten foe, and your skin will be safe.

The Radio Lizz

By Howard F. Mason, 7BK

NO, this is not a sequel to "A Kiss by Wireless," or "The Radio Garter." Radio on a flivver is entirely practical, and if the job is done right, will bring results that are worth bragging about, so we're passing along the dope.

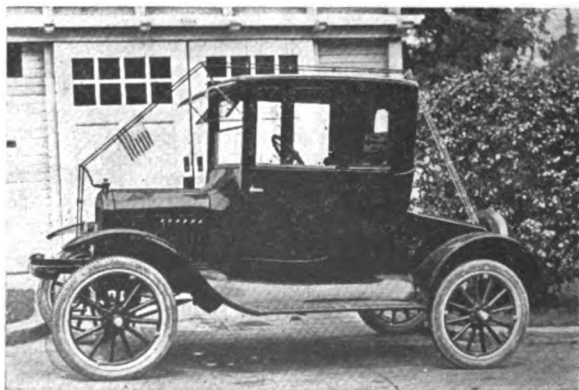
This installation was made several months ago by Mr. F. J. Brott, 7AD, of No. 10 Walk No. 1, Madison Park, Seattle. You will remember 7AD as the pioneer amateur of the Northwest, having done some mighty fine DX work in the past; consequently he is the man for the job, and he has boiled "flivver radio" down to a practical basis.

Referring to the pictures, the loop may be seen completely surrounding the car. It is made of three turns of small stranded rubber-covered wire, the total length being seventy-eight (78) feet. Disks of bakelite 2" in diameter, spaced every nine inches, hold the turns apart, and form the neatest looking little cage you ever saw. Special brackets support the loop in six places.

The receiver is located just inside the rear window, at the driver's back. A long slender, loud-speaker horn is fastened to

the top of the car, crosswise above the receiver in such a position that the opening is right above the driver's head. This receiver was especially designed for use in the car, and is therefore interesting.

It consists of a single-circuit tuner with tickler regeneration and a two-step audio-frequency amplifier. This seemed to be the best circuit to use, as it gives good signals regardless of the character of the road. As the radio set was made a permanent part of the Ford, it was necessary to make the



Miss Lizz—See the loop antenna?

receiver as small as possible. Its outside dimensions are $5\frac{1}{2}$ in. high 18 in. long, and 4 in. deep excluding controls. From left to right are: primary tuning condenser dial, tickler dial, inductance switch, detector and amplifier rheostats, and amplification switch. A connecting block six inches long, with spade terminals mounted on it, connects the various loop and battery leads to the set, utilizing the five binding posts at the bottom.

There is nothing unusual about the wiring diagram of the receiver, except that it is very necessary to have the same connections in the loop circuit as shown, if good results are to be obtained. The regular car battery is used for filament heating, the negative side of which is normally grounded to the frame.

Now, having looked over the installation, let's take a ride with 7AD, and see how this radio on a flivver differs from radio on the farm. Don't say that it won't work because the loop has too much iron in its field. It *does* work. In fact, it might just as well be tin in the field, as far as results are concerned. In the first place, when the engine is started, you hear QRM that sounds like four spark coils all going at once. It is. However, it does not drown out local signals, but it is necessary to stop the engine when receiving any station twenty or more miles away.

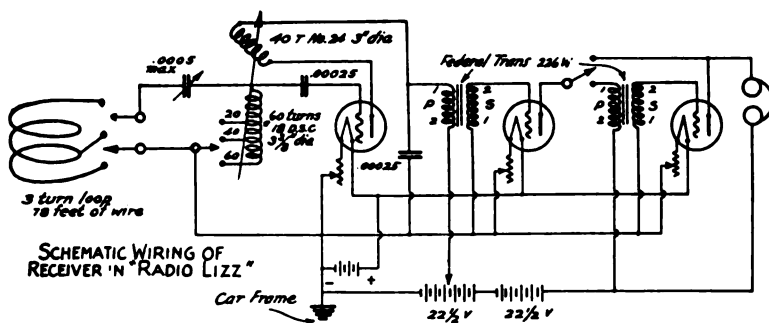
I did not ride far before I was convinced that the Radio Lizz was taking me

tion. Here was a good example of a "dead hole." From the above it would appear that a fellow's good or poor receiving results may be due to his location and if he would move up the street half a block, results would be different. On another occasion, signals were just as loud beneath a sixty-foot wet clay-bank as they were in the open. For long distance reception, it is absolutely necessary to get off of a



street where there are overhead wires, as the shielding effect is very great. Best DX results are obtained in a high open position, such as on a hill or a wooden bridge. In all cases the loop is very directional.

By way of receiving results, many amateur stations have been heard up to 1,000



off the trodden path and offering exceptional opportunity for the study of many of the curious things about this radio game. When going along a straight street, signals fade nearly out and then come in very QSA from 2 to 4 times in a block. For some reason signals are louder as a street intersection is passed. On one occasion, a fellow was having trouble getting broadcasts on his crystal set. The Radio Lizz was parked in front of his house and it was found extremely hard to receive signals from the local sta-

miles away; commercial and broadcasting stations are also QSA. Results seem to duplicate those of a similar receiver on the average antenna, with the advantage that you can pick out any location you wish from which to do your receiving.

Regarding the directive effect of the radio flivver, it sure is the berries for locating stations. In one test, Mr. Brott located a station in Seattle within a half an hour, the first hearing being taken seven miles from the station. Here is the procedure and there's nothing to it. By some

accident or otherwise, it happens that when reciprocal bearings are taken on a station, an absolute minimum is not obtained on both sides. If the station should lie on the left hand side of the car, an absolute minimum will be obtained, but if the station to be located is to the right of the car, its signals will be heard QRZ even tho the



loop be at right angles to it. This feature is attributed to the fact that the loop does not lie wholly in a vertical plane, as may be seen in the photo, but is off the center line of the car where it runs underneath. This also makes the iron in its field unsymmetrical. At any rate, altho we can't dope it out, this unilateral feature helps a lot in locating a station quickly.

The first bearing, using minimum signal, is usually taken from some spot, preferably on a hill, where there is a good view of surrounding country. Then, by sighting along the windshield, some land-

mark may be spotted and used as a reference when other bearings are taken. Having located the approximate district the unknown station is in, it is only necessary to drive along the street until his signals either go completely out, or nearly so and come in again. If the former obtains, he is to the left. If the latter, to the right. It is then necessary to go back to the dead spot, and turn up the side street and drive until his signals fade again, repeating the same procedure. After this is done two or three times, his signals will fade out and come in, in the same block, and then all you have to do, is back up a short distance and you are right in front of Mr. QRM's house whereupon you may enter and inflict the necessary punishment, or give him a ride down to the R.I. to get a license.

Here is another thing about the Radio Lizz, which proves that it is drawing the attention of many now interested in radio. Look closely at the wire of the loop, just above the radiator cap, and you will see that the insulation is actually being worn off the wire by curious passers-by who stop to feel of it, when the flivver is parked on a busy street. This is an actual fact.

Mr. Brott is now experimenting with an I.C.W. transmitter to be installed soon on his Radio Lizz, which will probably make it the most practical portable station of its kind in the country.

A Five-Watt C. W. Set

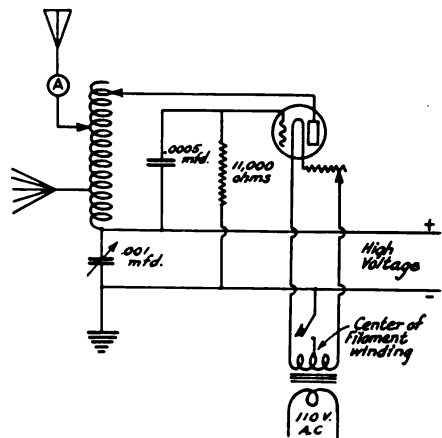
By George Milne, 2AFP

HAVING had so many requests for information on the five watt set which did such good work at this station on a single wire aerial, I thought that it might be of enough interest to the gang to warrant publication in QST.

The circuit is slightly different from any that I have seen so far. It is a modified Colpitts, in which instead of feeding the positive side of the high-voltage directly to the plate, it is fed to the plate thru the inductance. Previous to obtaining such good results with one five watter, I had been using ten watts but had burnt out one tube. While waiting for a new one I kept on using the one I had left and found to my surprise that, altho the antenna current was less, the range was much better. I had made a few changes in the circuit and it seems that I just struck the right constants "more by accident than by good management." I have taken the old set apart so can't help out with a photograph.

The circuit used is as shown. The inductance was a Radio Service and 19 turns were used. The grid condenser was a

Dubilier mica insulated, .0005 mfd. The grid leak was an 11,000 ohm graphite rod.



The part that I had most trouble with was the series condenser in the ground lead.

This was a 43-plate Mesco but when using 750 volts it sparked thru because of having the voltage directly across the condenser. I finally fixed this by immersing the whole condenser in a jar of oil.

The only difference in the hookup is, as I have stated, that the positive high voltage is fed to the bottom of the inductance instead of directly to the plate. The key is in the filament circuit. By placing it here a higher voltage can be used without overloading the tube, as the tube only works when the key is pressed. The voltage used was 750, A.C. rectified by a 24-jar chemical rectifier using the "bridge" connection. Antenna current was between 1.5 and 1.8 amps with one tube and about 2.4 amps with two tubes in a single wire antenna 80 feet long and 32 feet high. I have not as good a location as most of the bunch seem to think. I have mountains on three sides about $\frac{1}{4}$ of a mile away and the

aerial is entirely surrounded by trees. In fact it is what I call a *punk* location so that the DX can not be blamed on that. Ground connection was made to the city water pipes.

I am using this circuit now with a 50-watt tube and get 4 amps into a five-wire flat top with a four-wire counterpoise. I won't guarantee this hookup to be better than any that is out but it has proven better than either the English Feed-back or the Hartley, giving between three to seven-tenths of an amp. higher antenna current on the 50 watter. Sigs with one five watter were reported from Minn., N.D., Iowa, Alabama, and Florida as well as 1050 miles out on the Atlantic.

I hope this will be of some benefit to the fellows using one tube and would like to hear from anyone who tries it, as to results obtained.

A Brush with the Cops

By F. B. Ostman, 20M

LATE in this past summer we had three successive nights of good DX weather—good considering the summer. DX was busting through all evening from 5 P.M. on, and the desire to work 'em was so great that we couldn't hold the key, regardless of the fact that local broadcast listeners were being jammed on their \$2.98 sets.

The third night the local phone listeners decided things were going too far. The concert was good, and they had no trouble guessing who that QSA spark was. We're the doormat here for all locally directed mail, complaints, etc., being known as WNY, NAH, WCG, KUVS, KUSM, in fact anything that's QSA-very on their Woolworth sets. I suppose we deserve this for having spark instead of C.W., anihw....

Right in the midst of hammering out a TR to 1CNI, in pops our local detective. Of course we finished said message, and had to shut off the gap; old boy Officer had to rub his eyes to get the glare away of the open sink gap spark before starting to tell what his mission was.

I thought at first that he had come up from headquarters for some information regarding the installation of a set, as I had heard that the policemen were going to get an outfit. However, 'twas otherwise. The dialogue went something as follows:

Officer: We've had three complaints tonight by telephone, saying that you fellows were breaking up the concerts from Newark. The chief sent me up to inquire if you wouldn't discontinue operating, which

would please Mr. M—. We realize that we have no jurisdiction over this radio business, but the chief sent me up, and it was my duty to come.

20M: Well,—er—you see we haven't operated during the early evening since last March, and we had some important traffic we wanted to clear. Besides, we don't feel that we should have to sit up until midnight before we operate our transmitter. We have been co-operating with the phone listeners for the past months, and as soon as we operate a little, they go up in the air and want us to close up. You know any well made receiver in town here should be able to tune out our signals and receive the phone concerts without interference. The trouble is caused by these fellows with \$25 and \$15 receivers....

Officer: I don't happen to know what kind of sets two of these complainers have, but I understand that Mr. M—'s set cost between \$800 and \$1000.

20M: (Not knowing who Mr. M— is) Either this man M— was stuck when he bought the set, or he doesn't know how to tune it.

We then talked with Mr. Officer for about half an hour, showing him our side of the game—how we've worked to perfect our receivers, and how the game is being ruined by sets that we discarded before the war. We showed Mr. Officer the outfit, how it works, the cards, switches, receiver, spark and C.W. sets, motor generator, talked about oscillations, etc., until the poor fellow walked out in a whirl,

thoroughly siding with us, how great radio was, and what a set we had, etc., etc. After he left we had a good laugh, and went on pounding brass. You know what a lot of radio four hams (there were four of us in the station at the time) can tell a guy in a short space of time. All the fellow could do was "yes, yes, yes." Every-time I think of it I have to laugh.

Next day, Mr. Officer sees Mr. M— in town and tells him we said he either got stuck with his set or he didn't know how to tune it. Mr. M— goes off the handle, and exclaims that he'll pay those kids if they could come up and teach him how to tune his set.

Let me explain here. Mr. M—, although we did not know it at the time, is first assistant deputy motor vehicle inspector of our state, being second man under the governor. The following evening Mr. M— rolls around in his big limousine to 20M's ranch.

No doubt he was sore; he showed it. He is a fellow I guess that's used to dictating orders, understand, and being told where he gets off completely upset him.

Even before he would listen to reason, he threatened to have the radio inspector close us up. Why, the expert from the G— company, whom he bought his set from, and who installed it, told him we were on about 385 meters, and not even licensed. If this is true, I wonder what is happening to our old friend G—.

It happened that just about a week before this I had called on our radio inspector, Mr. Batcheller, as traffic supervisor for the Executive Radio Council, 2nd District, regarding a proposed plan we had outlined whereby amateurs in the district would stand by for a couple of hours in the evening so no interference to phone broadcasters could be blamed on amateurs.

Our inspector was entirely adverse to any such arrangements, stating that if after

the new legislation before Congress was passed, interference still continued, some arrangements might be made to stand by. Now with phone broadcasting going on later each night, the listeners would expect it always; he requested us to continue with our present regulations. **HOT DOG!**

Knowing our position and where we stood, we politely told Mr. M—that he could go as far as he liked. Mr. M— said if he could secure no satisfaction from the radio inspector he would bring the matter to the attention of his friend Senator E—. I again told Mr. M— we were a licensed station, operating in every respect within the law, and doubted whether he could close us up.

Understand, such threats as he made were absolutely out of order, and naturally got US sore. After making this last remark, playing his last card as it were, and seeing he could not alter us, he began to take an interest in our side of the game. He spent at least two hours at the station and left in a decidedly different mood, even offering us cigars, and promising to have the car around for us the following night, when we were to go to his place, see his set, and try to tune our signals out.



The following night: At about 8:15 Mr. M— arrived. I had retuned the spark transmitter to 200 meters as sharp as it goes— on full power with five inch coupling, which seems best. I showed Mr. M— the tuning on a standard U. S. Navy S. E. 965 wave-meter, and tried to explain that the transmitter was tuned to our legal wave, etc.

Leaving 2AJA, a local man, at the station to work the transmitter, we left to see Mr. M—'s set. We arrived at Mr. M—'s palatial home—it was really that. We could not see his antenna in the darkness but he explained it to us.

His receiving outfit consisted of a G— a single-circuit tuner and a two-step amplifier, Western Electric loud talker, etc., all

mounted in a music cabinet, all very neat. WJZ at Newark was giving his evening concert, and while 2OM was working on full power, five inch coupling, less than $\frac{1}{4}$ mile away air line, "SW" of this station tuned our signals out so completely they could not be heard through WJZ. Signals from WJZ were so strong that the Western Electric made them too QSA for comfort in the room. Not so bad for a single-circuit receiver, but give the transmitter credit, too; it must have been a little sharp. I would like to state here that no three-circuit receiver in town has trouble tuning out 2OM when listening to broadcasting on 360 meters, and a large number of these sets are home-made.

Mr. M— was very much puzzled why *he* couldn't do that, and we explained to him

the much repeated story of poor receivers, etc. We advised ("we" being three ops from the station, SF, SW, SL) that he exchange his single-circuit tuner for one of the three-circuit type, which would tune more sharply, and allow him (one not adept at tuning) to eliminate all interference he might get from local amateurs.

Mr. M— returned to the station with us. We told him of the A.R.R.L., the DX covered, trans-atlantics, trans-cons in 6½ minutes, etc. We expect him to join the Ridgewood Radio Club this winter. In fact he is so taken up with our amateur game that he forgets the concerts; he is anxious, he says, to learn the code, and might put up a big club station on his five acres in Ridgewood. He's got the jingle, we know, and he might turn out to be a second Mr. Beale.

A Chat about Variable Condensers

By Norman A. Woodcock *

TEN years ago, when "broadcasting" as it is now known was practically non-existent, and vacuum tubes were in an early stage of development, much apparatus was used which has since been relegated to the scrap-pile. This class includes magnetic detectors, straight spark gaps, anchor spark-gaps in the antenna, spark-coils, Leyden jar condensers, and many other pieces of apparatus now obsolete.

There is, however, another class which includes apparatus which has been used in radio work since the early days, and which is still doing duty in our most modern radio installations. This apparatus, tho performing its original functions, has been so developed and improved as to be almost beyond recognition in comparison with its original prototype. Exception to the above must be taken in certain cases—a striking example being that of the common variable condenser usually used in receiving apparatus. Tho millions of these condensers have been made, the majority of them are "Chinese copies" of preceding condensers, and contain faults which should have been eliminated years ago. To all appearances they worked fairly well, so apparently not much attention was paid to their improvement. Conditions have changed greatly during the last decade, and the increasing use of highly sensitive circuits, together with tremendous amplification, has shown up defects in condensers not even suspected by radio fans or even commercial operators in many cases.

To deal with a specific instance—let us consider the increasingly popular loop or frame aerial. The usual method of tuning is to place a variable condenser either in series with or across the loop. No matter how well the loop is designed and built, maximum efficiency cannot be obtained unless a correspondingly efficient condenser is used. The total energy picked up by the usual small loop is so small in the first place that the ordinarily negligible loss in the condenser becomes of paramount importance in this case. In fact there is no doubt that the poor results so often obtained in loop reception are in many cases due to the use of cheap and badly designed condensers. This should be kept in mind when buying a variable condenser for this purpose and care should be taken to select one in which losses are at a minimum.

As information and literature dealing specifically with condensers are not readily available, a few points may be noted as a guide to be used when purchasing or building variable condensers for radio work. It is not easy to select a really efficient variable condenser off hand, but as a general rule, the mechanical construction is a good place at which to start.

The frame should preferably be entirely of metal. It should be rigid in order to secure permanent alignment of the plates, and if possible a type should be selected which is free from all insulating bushings. These latter are a flagrant source of trouble resulting from leakage due to moisture,

*Engineering Dept., Allen D. Cardwell Mfg. Corp.

etc., forming a conducting film over the surface.

Another desirable feature rarely seen is a condenser arranged so that the rotor is inherently grounded—thus eliminating the body capacity-effects so noticeable in regenerative and similar work. Further advantage is that such a condenser may be mounted on a metal panel if desired, without affecting its capacity in any way.

Whilst a certain amount of dielectric, such as hard rubber or bakelite dielectro must of necessity be used to insulate the movable and fixed plates from each other, this should be reduced to a minimum to avoid losses. The best possible construction would be where the dielectric was so located as to be entirely without the electrostatic field of the condenser.

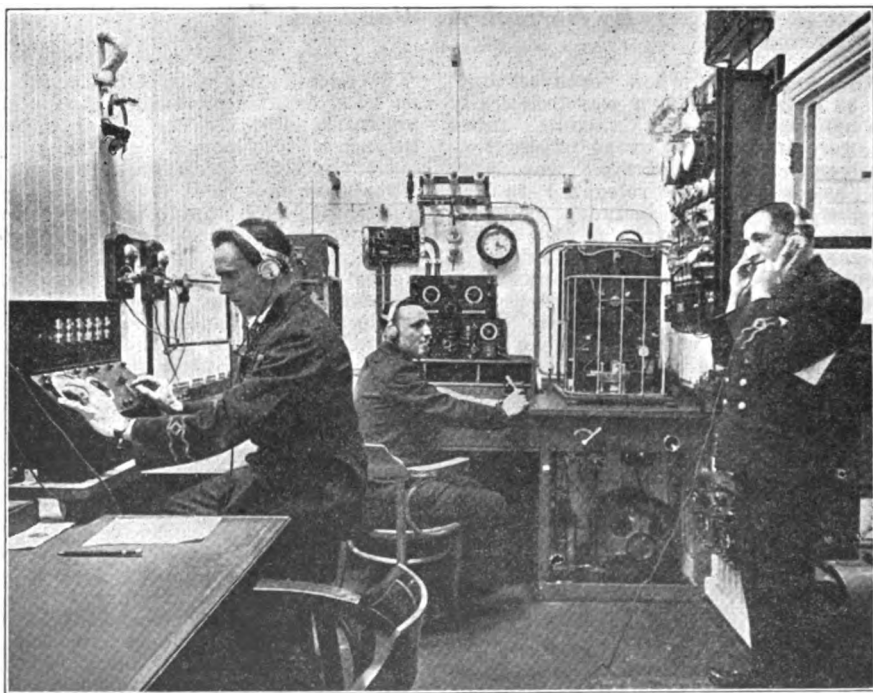
To secure the greatest flexibility in tuning, a condenser should be chosen which has a wide minimum to maximum range; whilst the actual capacity should be reasonably close to that stated by the maker.

There are some variable condensers now on the market rated at 500 micro-microfarads capacity which actually measure 397 micro-microfarads.

The above hints should enable anyone to build or purchase a really efficient condenser whilst it may be emphasized that any efforts made to secure this end will be more than repaid by the enhanced results in operation when the set is completed.

REMEMBER!

The success of America in the Transatlantic Tests demands QUIET AIR during our listening periods. Read the schedules on page 10 and the leading editorial this month. Pass along the word. *We must make good.*



The Static Room of the Great Liner "Majestic"

This is a photograph of the radio room of the world's biggest ship. On the farther side of the room are the two transmitters—the 2000 mile continuous wave transmitter at the left of the operator in the armchair, and at his right is a spark set with a range of 800 miles. The third operator is at the key. On the right stands the chief operator, listening to telephone messages, while the second operator is shown at the left operating a Marconi radio compass. On such equipment depends the safety of the 5100 people carried by the "Majestic"—4100 passengers and 1000 crew.

Photo by Ewing Galloway.

Listening for Europe

By Paul F. Godley, 2ZE

A year ago this month Paul Godley was in the British Isles as the special representative of the A.R.R.L. in our Second Transatlantic Tests. Establishing a listening station at Ardrossan, Scotland, in a ten-night vigil he copied many American amateur signals and gained for himself enduring fame in amateur circles. Here, then, is a word of advice on the Third Tests from the man who succeeded last year. —Editor.

THAT A.R.R.L. men should need encouragement in connection with their preparations for the reception of radio signals from European amateurs this month is unthinkable and yet I hope that what random thoughts are here set down may come as an encouragement to some one. First of all let it be understood that American amateurs will hear European amateurs during these tests. And, so let it be known that if two-way communication is not established, American amateurs will not have justified the great confidence which European amateurs have in their ability to perform. There has come to me only a smattering of information concerning plans of men in England, France and Holland. They are making plans, however, and there is little doubt that insofar as receivers are concerned at least they will be better outfitted this year than last. In connection with transmitters it will be remembered that several stations rating under 50 watts in power were heard in Scotland. We have many, many stations which rate 250 watts on this side and the British will perhaps have at least two or three. So, barring very bad luck with regards to meteorological conditions, complete success is to be expected under which circumstances it ought to be the ambition of every going A.R.R.L. man to get in on these epoch-making tests.

About Receivers

Regardless of results obtained in Europe last year both by the British and myself, there is still ground for considerable speculation as to the type of receiver which may be used most effectively by the average amateur. If you feel yourself fairly familiar with the operation of multi-stage amplifiers, either straight radio frequency or of the super-heterodyne type, I should not hesitate to recommend one or the other, always choosing myself the last-mentioned. The British seem to pin their faith upon the multi-stage radio frequency, partly, perhaps, because of the general tendency in Britain toward this type and partly, no doubt, because of the lack of publicity which had previously been given to the super-heterodyne method, for, it will be remembered, it is a 100% American method. I have tried them both. The

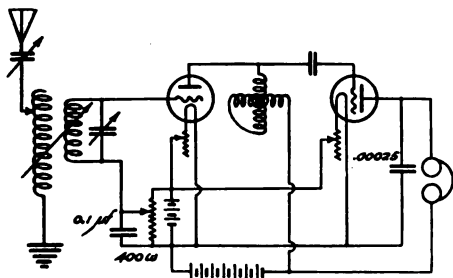
latter is selected because of its greater efficiency for a given amount of tuning; because of the simplicity of its control once it is going properly; and because of its great quietness in operation. Fairly complete instructions which can be readily absorbed by any who have had experience with multi-stage amplifiers have already been printed in the pages of amateur periodicals within the last two years. If no experience has been had with this type of equipment, I should not recommend it as a good bet. It takes too much time for one to become sufficiently familiar either with a multi-stage radio frequency outfit or a super-heterodyne outfit to make it advisable for him to alter his plans for receiving at this late date. For it has been my experience that the greatest contribution toward successful results with receiving apparatus consists in the operator's thorough familiarity with the receiving apparatus which he is to use. From observation it is my opinion that as many operators will receive signals during the coming tests on the regenerative type of receiver as on the multi-stage amplifier types, and it is based partly on the fact that altho it was my good fortune to receive a total of twenty-seven or twenty-eight different amateur stations in Scotland last winter, several British amateurs at the same time received signals on apparatus of much simpler construction.

A rather simple and desirable addition to the regenerative receiver might be one stage of regenerative radio-frequency amplification as shown in Figure 1. This device is slightly different in its operating characteristics from the conventional regenerative receiver, but considerable increased sensitivity is to be experienced, and to one who is familiar with regenerative receiver operation no great difficulty will be encountered in mastering its little peculiarities. One or two stages of audio frequency may be used, tho I would suggest that as good results will be had where no audio frequency amplification at all is resorted to. Audio frequency amplification tends to emphasize static and signals from nearby stations and in many cases has been known to rather deaden the sensitivity of the ear to weaker impulses, while if full dependence is placed

in the regenerative amplification for signal strength, it is quite certain that the operator will at all times have his receiver in the most sensitive condition.

About Antennae

It has always been our habit to think of the very high antenna as the best for receiving great distances. Barring inter-



ference such as harmonics from high power stations, broadcasting stations, static, and ship's spark stations, this would be true. But far greater selectivity is to be had where an antenna of medium height is used, and by medium height I mean something in the neighborhood of 40 to 50 feet. This fact has been very forcibly demonstrated to me during the past few days where some reception tests were made upon a "T" type antenna having a vertical height of about 100 feet, and a flat top of about 60 feet. Signals of great intensity were received upon this antenna, but the reading of them was a far more difficult matter than was the case with the weaker signals obtained on a smaller antenna. No matter what the strength of the signal, if due to interference it is unreadable, it is of no value.

Of course, those who find it possible to erect a Beverage Wire should by all means do so. I doubt very much whether any great difficulty will be encountered by anyone in so adjusting this wire as to give him quite remarkable reception over long distances. To get the most out of it calls for a careful study of the observed actions after it has been placed in operation. It should be encouraging, however, to know that even the top wire of a barbed-wire-fence frequently gives far better reception than a fairly elaborate and carefully constructed amateur antenna. This can only be true, of course, when the weather is dry, but insurance against wet weather is possible thru insulation. Quite complete details on Beverage Wire construction have already been printed in this magazine.

About Selection of Tubes

There is nothing which will more completely defeat the reception of extremely

weak signals than an inherently noisy receiver. Great care should be given to the insulation of the antenna and to securing it in such fashion that it does not swing in contact with *any* nearby tree, antenna support, or building. Similar care should be taken to see that the receiver circuits thruout are in perfect order, and finally considerable attention should be given to the selection of the tubes which are to be used. The gassy vacuum tube is one which amateurs have long favored. It is truly a remarkable device, but too many of them show tendency toward a chronic noisy condition. In making tests for sensitivity of tubes in *all cases* tests should be made on extremely weak signals only. A tube which frequently appears to be most sensitive actually may not be due to its inherent noises. Ever present noises tend to deaden the sensitivity of the ear in the same way as the louder signals previously spoken of. The ideal receiver is one which is *deadly silent* during periods of no signal. One thing in favor of the regenerative radio frequency arrangement above mentioned lies in its greater freedom from inherent noises. The selection of the vacuum tubes and their placement in the super-heterodyne receiver is of particularly great importance. In the multi-stage amplifier, noises are quite apt to multiply rapidly. To get eight or ten tubes working in a truly silent fashion is no mean task but those who aspire to use a receiver of this type should not pause until they have been able to get true silence.

About Geographical Location

It is quite likely the most success will be had by those men in the eastern section of the United States, tho I should not be at all surprised if some hard working ham in Chicago, Denver or Dallas is able to list himself as a lucky listener. If any are able to take up temporary quarters near the seashore I should recommend this. It has been my observation that signals coming in from out to sea are frequently much stronger nearer the water's edge than but a few miles inland. It most certainly is a fact that the strength of signals from American transmitting stations located nearer the seacoast was uniformly greater than the signals from stations of like power located further inland and it is to be assumed that if this is a rule, it works equally well both ways. This by no means indicates that inland amateurs will be entirely left out. Success in their efforts will only go to show that their determination and faith and patience is the more creditable.

If memory serves me, there were in Scotland, England, Holland, Germany and France, nine amateurs who received sig-

nals from America in last year's tests. There are in these countries a total, perhaps, of 1,000 real radio amateurs. On a percentage basis, then, the close of the reception tests should find in America

about 250 amateurs who have heard signals. If there are four times this number I shall not be surprised. If there are less than that number, I shall be greatly disappointed.

A Spark Set that will Hold its Own

By H. S. Morris, "WD" at 8BDA

SO much has been said concerning the continuous wave method of transmission in recent months that one almost forgets there is such a thing as spark, but such is not the case. The few articles on spark that are published relate to expensive high-voltage transformers, sink gaps and Dubilier condensers, which the average amateur cannot afford. The following is a description of the spark transmitters used at 8BDA which have proved very efficient, all apparatus being home-made save the transformers and rotor disks.

It was found by experiment that the most efficient type of oscillation transformer was the "split" type, it giving an increase of three amperes over the regular type, just doubling the indication on three different local spark transmitters. Few amateurs know of this type of coupling and still fewer use it, tho once tried always used.

The only difference in the split type O.T. is in the primary which consists of two brass or copper ribbons three feet long, each arranged to form a semi-circle about twenty-two inches in diameter. The transformer and gap are connected to one end of each of the ribbons while the condenser is connected to the other ends, thus connecting all apparatus in parallel. There are several marked advantages this type of coupling has over the regular type.

1. First and most important, it does away with all leads in the primary oscillation circuit, making the complete primary active on the secondary.

2. It enables the use of a condenser of larger capacity for a given wave-length

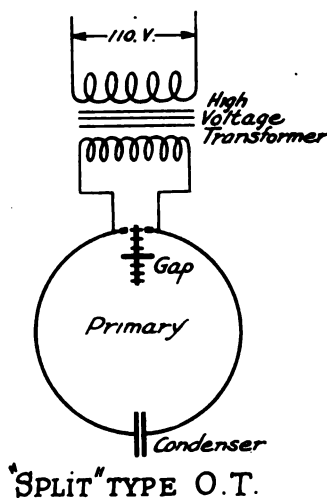
3. As all apparatus (transformer, gap and condenser) is connected in parallel, it gives a balanced circuit with the same amount of inductance and ohmic resistance on each side.

4. It has six feet of active primary while the regular type has but three or four feet, the rest being taking up in useless leads.

5. It makes possible an easy arrangement of apparatus, for both looks and efficiency.

The secondary of the O.T. is of the regular pancake type of twenty feet of brass ribbon, one and one-fourth inches

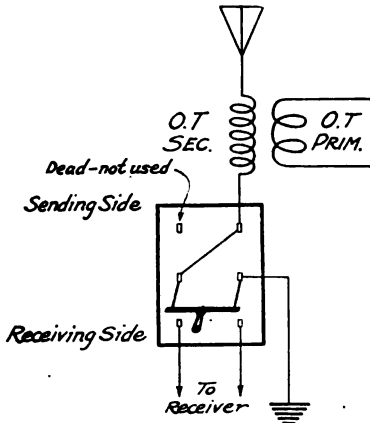
wide, wound on bakelite eighteen inches inside diameter. To insure still better insulation the aerial lead-in was brought in thru the roof directly over the transmitting apparatus and the O.T. secondary suspended from it in mid-air with no other support, thereby making one-hundred percent insulation.



At the present a separate aerial is used for receiving, doing away with all switches in the aerial circuit, but before this was arranged much energy was lost thru the aerial switch even tho the best grade of marble base switch was used. To do away with this the switch was connected as shown in the accompanying diagram and found to work very satisfactorily. As seen, the aerial lead is connected directly to the O.T. secondary, which is *very* important in transmitting, while the switch is placed in the ground lead where insulation is not so important. When the switch is on "sending" the receiving apparatus is completely disconnected. While on "receiving," the aerial connection is made thru the O.T. secondary, thus adding inductance to the aerial receiving circuit, which is highly desirable, as it has been

proved here that an aerial designed to transmit on two hundred meters is not long enough to give best results in receiving the same wave-length.

It was found that when using a low-voltage (15,000 V.) non-resonant Acme transformer, best results were got with a ten-tooth Benwood rotor with a comparatively high tone. With a higher voltage



(25,000 V.) Thordarson transformer, the best results were obtained on a five-tooth (every other tooth cut out of a ten-tooth disk and stationary electrodes arranged at an angle so two teeth would line up at once.

As both gaps were belt driven much trouble was experienced with the rotor bearings wearing out. At last this was

solved by using a ball-bearing bicycle hub as a bearing for the rotor disk. The drum of the hub was clamped tightly between two blocks of wood and mounted on a base. The rotor was then mounted on one end of the axle and the pulley on the other end. This turned out to be the ideal bearing, being noiseless, durable, practically no vibration, and as near frictionless as possible to get.

As to condensers, probably the most practical home-made condenser is the so-called "milk bottle type," it having the advantage of being cheap, easily made, oil immersed, easily replaced when blown, and hard to blow. For a 1 K.W. about twelve pint milk bottles are used, each filled to within about one-and-a-half inches of the top with a strong solution of salt water, then filled on up to the top with oil to stop brushing. All bottles are then placed in a metal tank and salt water poured in until it becomes level with the salt water in the bottles and then covered with about an inch of oil. One connection is made on the metal tank, thereby connecting to the outside salt water, while the other connection is made by running a small piece of copper ribbon or wire into each of the bottles, connecting with the inside salt water. The novelty of this condenser is that when one bottle is blown another extra bottle can be inserted in its place in a few seconds.

Beer bottles have been tried but on account of the impurity of the glass do not work as well as milk bottles. Theoretically the best kind of bottles would be whisky bottles, as they have more kick in them. Hi! At present a plate glass condenser is used.

An Armstrong Single Tube Super-Regenerator

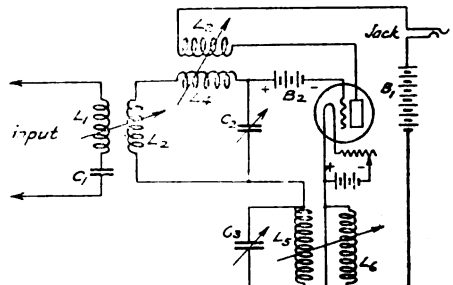
— Fourth Prize in QST's Contest —

By William Englebretson

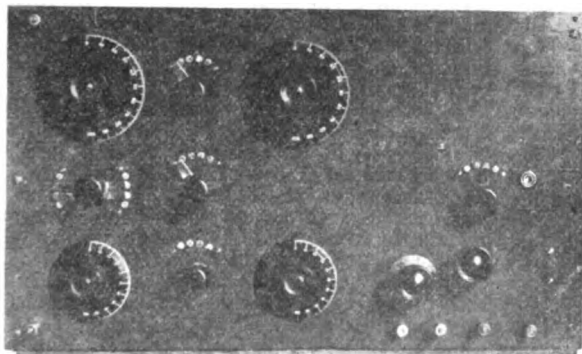
SO much has been written and said about the Armstrong super-regenerator and its good and bad qualities that the amateur does not know which way to turn for advice. Anyway, the only practical knowledge one can obtain about this circuit is in the hard school of experience. The writer has been through the mill and has burned much midnight oil in trying to dope out the new circuit and now blossoms forth with the following article, in which he hopes to make clear the results of his experiments.

Armstrong secured super-regeneration by any of three methods: first varying the positive in respect to the negative resistance; second, varying the negative in re-

spect to the positive resistance; third, varying both.



All these circuits were tried and it was found that a two-tube circuit worked well using either of the first two methods but that using one tube and the third method equal results were obtained. This may be accounted for in the fact that the second tube merely generates the variation frequency and does no amplifying in itself. By putting all this work on one tube the



expense of a second tube is saved. Everybody seems to object to the single-tube circuit, claiming the variation frequency is hard to control. This was not found to be the case.

The circuit described herein is a modification of that shown in Figure 3 of July QST. It differs from that used by Armstrong, being a two-circuit instead of a single-circuit tuner. This is a distinct advantage as it makes for sharper tuning—a necessity with the “super” on account of the terrific amplification obtained. The circuit uses no separate detector. Though the variation frequency is within audibility, it is so weak as to be scarcely noticeable.

For C.W. reception and phone, the circuit is all that can be desired. Local stations come in on C.W. with a roar that makes it almost impossible to wear the fones, while distant ones have a flute-like sweetness which sends thrills up the spine of the most hardened ham. Of course the broadcast stuff comes in with a roar. Turn up the dial to around three-sixty any evening and listen to the excitement. You hear two or three to every degree of the scale from Schenectady to Denver and back again. Sparks are not amplified to as great a degree as C.W. signals. The variation frequency seems to tear them apart so that they sound scattered, but most of them are quite readable. They require more negative grid voltage and different adjustment of the circuit. Hand in hand with this goes the remarkable freedom from static. Lightning discharges re-

semble sparks in that they consist of free oscillations. These are chopped out periodically and are not heard. This may sound contradictory to the first statement about sparks but it must be remembered that when fishing for sparks special and careful adjustment of the circuit is necessary. When ordinarily adjusted for C.W. reception sparks are not heard at all.

The parts required for the tuner are as follows:

L1 and L2—Variocoupler, 24 turns primary, 24 turns secondary.

L3 and L4—Variocoupler, 24 turns secondary, 75 turns tickler.

L5—1250-turn Honeycomb Coil.

L6—1500-turn Honeycomb Coil.

C1—Variable Condenser, .001 maximum.

C2—Variable Condenser, .0005 maximum.

C3—Series of fixed condensers giving values .0005, .001, .0015, and .002 mfd.

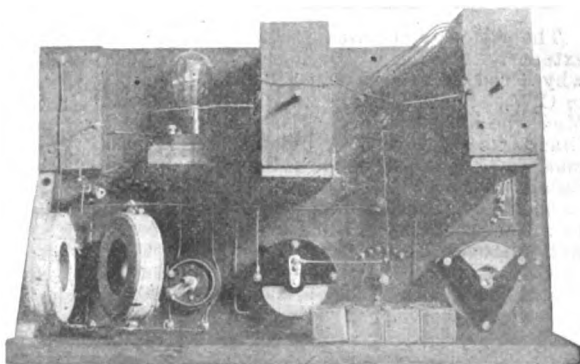
S—Series-parallel switch.

T—U.V.201 and socket.

B1—90 Volts.

B2—1½ to 6 volts, variable.

The assembly of these parts can be seen in the accompanying photographs. In the lower left-hand corner can be seen the large coils for generating the variation frequency. They are controlled by a special cam arrangement, though it works just as



well to have them on the front of the panel and work them by hand.

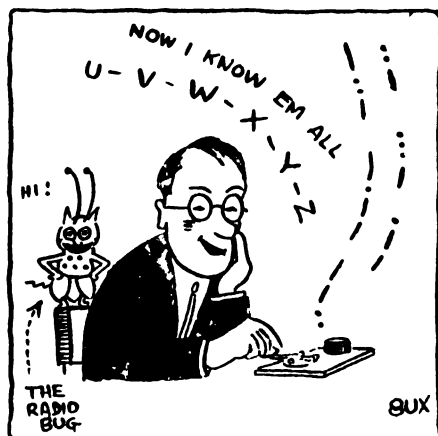
Now for a few hints on operation. The coils are brought together until the variation frequency manifests itself in a weak, high-pitched squeal. Then increase tickler almost to maximum. The circuit may then be tuned as in an ordinary two-circuit tuner except that on the lower wave-lengths the tickler must be turned back to keep the

(Concluded on page 39)

A Ham What Am

*By One of Them, Whose name is Concealed
Because his Wife might read this*

THE Depths of Wild Debauchery to which certain Amateur Operators will Descend when they have A Chance to spend a Night in the City of New York, are almost without Any Bottom whatever. Not very long ago a Certain Meeting took place in New York, and it seems that After the Meeting was Over, certain of these ops Got Together with some other Congenial Souls, and the Festivities Continued well into the Graying Dawn.



The Atmosphere was Heated to a great extent with several Discussions as to just why Fred Schnell was so Blamed Partial to C.W., said ops. being all Old Time Spark Men who have Little Use for the Evacuated Glass Case Method of Transmission. These men, who are all Good Members of the Second District Council and the A.R.R.L., carried this Discussion up and down Park Row, across City Hall Park, and pretty well all over Lower New York. The visit to City Hall Park brought all Activities to a standstill, while the Little Group stood in Awe at the foot of "Civic Virtue." The sight of this Colossal Figure, standing there in the Moonlight, brought Dim Memories to one of the men of a Turkish Bath, located Somewhere in the Vicinity. While On the Hunt for this place, one of Them became Lost to the Rest by Deftly Dodging into the Subway. It turned out, Later On, that he was the Wisest One of the Lot.

Finally the Bath was Reached, and after a preliminary Disrobing Act, which cannot be Illustrated here, the Loyal Four found themselves Thrust Bodily into a Glass Enclosed Room, where the Temperature ranged well up on a Par with a "P" Tube

carrying Three Thousand Volts on the Plate. After Seating themselves Comfortably, the Gang continued the Heated Discussion as mentioned Above. This time the Talk was Heated both Figuratively and Literally. The rest of the Course is more or less of a Blurred Dream, with Dim Ideas of hearing such Terms as "Five Hundred Cycle-Sink Gap-Sixty Cycle-Sharp Wave-Decrement—and Schnell, Schnell, Schnell." This seemed to Keep Up for a Long Time, but Eventually the Clan found themselves on the Brink of a Silver Sheet of Water, and the Next Moment they were all Madly Swimming for the other end of the Tank in the Icy Cold Water. Long before the Other End was reached, they all knew Exactly where they Were, and Sleepiness gave way to a Real Effort at Having A Good Time in the water. Exhibitions of Fancy Diving, Races and Various other Forms of Aquatic Athletics were Indulged In until a Late Hour, and were stopped only by a Growing Tendency on the part of the other Inmates to quite Forcibly Object to the Hilarity by the Pool.

Things Quieted Down for a little while after this, and the Hardy Mariners found themselves Wrapped and Sheeted like so many Egyptian Lummies. Cigarettes and other Forms of Dissipation were Indulged In until Two of the Pharaohs became Involved in a Deep Discussion on Religion. This soon had its Affect on the Other Members, and after the Discussion had Gone On for Several Hours, the Remaining Duo decided to Call it a Day and Go To Bed. This was Received with Howls of Derision from the Others, but Finally all were Padding quietly down the Corridor to their Respective Couches.

There is Little More to be Told. There were Other Arrivals during the Night, and if the Sleep of the Four Horsemen was Totalled Up, we Venture to Remark that it would not have Exceeded One Hour for the Whole Night. During the Few Minutes between the Arrival of the Last Guest and the Milk Man, though, there was a Short Lapse, and it was at this time that the Night's Rest was Secured. Upon regaining Consciousness the First Thing that Assailed Our Ears was a Sentence Something like This: "Wynell can't Schnell give us Spark Guys a Square Deal and Lay Off this here C.W.?" They were Still At It.

Moral: It's hard to Find any of the Old Gang Flocking Together anymore, but did You ever hear of a Gathering of Broadcast Listeners doing anything as Wild as This?

An Electrolytic "A" Battery Charger

By J. A. Miller, 3LF

FOLLOWING is a description of an electrolytic rectifier for battery charging.

First take a board 14 in. x 2 in. x $\frac{1}{2}$ in., and fasten to it a sheet of lead and a sheet of aluminum, each eleven inches square and one-sixteenth of an inch thick, so that they will hang with a space of two inches between them, as shown in the diagram. If the metal is stiff enough, nothing further is necessary. However, it may be desirable to insert a wooden separator between the plates, but if this is done it should be fastened to the top cross board and no nails or screws should be used between plates and separator.

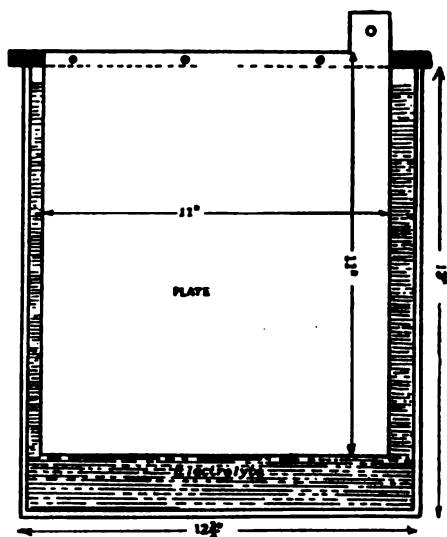
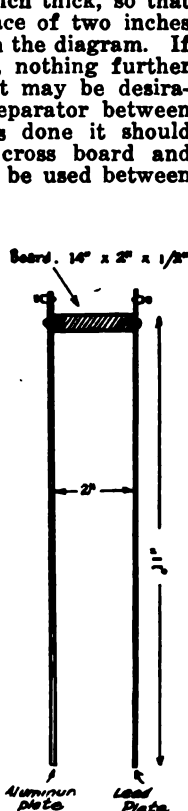
A six-gallon crock, of the "home-brew" variety, thirteen inches deep and twelve inches in diameter (inside measurements) should be filled within two inches of the top with water, and "20 Mule Team" borax added until no more will dissolve.

The plates should then be placed in the crock, and the board to which they are fastened will keep them about two inches from the bottom.

Then connect to it the filament-heating windings of a C.W. transformer and let the current run through the rectifier until the plates are formed.

The above is an exact description of the rectifier in use at my station (3LF) and it certainly does deliver the goods. I use it to charge my ten-volt storage battery, at a rate of five amperes, over night. The next morning the battery is fully charged,

and the charging rate has evidently "tapered off" as it progressed, for there is hardly any current flowing in the circuit after the charge is complete.



The temperature of the electrolyte after the charge is completed is just the slightest degree warmer than before using it. There is no heating or boiling away of the electrolyte whatever.

I consider this to be the most practical battery charger for the amateur station. Once constructed, it may be placed in a corner and forgotten about, for it is only necessary to add water to replace that lost by evaporation.

It may be operated from the low tension windings of the C.W. transformer or a transformer can easily be wound to meet one's needs.

AN ARMSTRONG SINGLE TUBE SUPER (Concluded from page 37)

tube oscillating. This applies for C.W. and phone reception. For spark, the filament temperature must be decreased a little and more volts brought into the grid circuit.

Various experiments have been made to obtain a filter which would eliminate the variation frequency without reducing or

distorting the signal frequency but none have been satisfactory as yet. The writer believes that with two stages of amplification coupled through a satisfactory filter, wonderful results could be obtained.

(The Third Prize Article, by Leon W. Bishop of 1XP, introducing a new idea in the generation of the variation frequency, will appear in the next issue of QST.—Ed.)

QST's Subscription Contest Ends

By the Contest Manager

That is, it ends for the fellows who couldn't quite make the grade and qualify with the minimum of 25 subs, tho they worked hard in most cases and have won our sincere appreciation, if not a prize. But we venture the opinion the lucky ones will get a considerable kick out of this contest for the next few months when they look at that prize resting peacefully

writing friends all over the country, never losing an opportunity of bringing QST before a prospect and extracting his two dollars while he had him in his power, and even going so far as to *advertise* for subs in the local newspaper. Which accounts for the fact he rolled up a total score of 151 and qualified for a \$75 prize. FB Corlett, OM!

F. M. Corlett	151 subs	\$75 prize
A. C. Koch	55 subs	\$25 prize
E. Raguse	36 subs	\$10 prize
K. B. Lloyd	33 subs	\$10 prize
D. W. Pinkerton	33 subs	\$10 prize
A. E. Rowland	30 subs	\$10 prize
H. E. Watkins	30 subs	\$10 prize
W. W. Filson	27 subs	\$10 prize
S. W. Beyland	26 subs	\$10 prize
F. D. Fallain	26 subs	\$10 prize
W. C. Burns	25 subs	\$10 prize
W. L. Gardner, Jr.	25 subs	\$10 prize

on the operating table and think of the fun they had in working for it. Wasn't it worth while? From the letters we got from contestants it seemed that way to us and we certainly got lots of real, genuine pleasure in watching the subs come in from day to day, tho of course, that was what the contest was for. Towards the last there were several surprises in the shape of a whole sheaf of subs coming in from some unexpected source, like those of Mr. Lloyd who mailed us 31 all in one batch the last day and almost the last hour of the contest, while Mr. Koch tried the "gently but firmly" plan of sending us two and three subs every day as regular as clockwork till we got to know and salute his notepaper as soon as it came in the room.

Right from the start, Frank Corlett had the jump on the whole gang but he went after the subs on a systematic basis, calling head work and foot work into play,

There were 121 contestants in all that got one or more subs, but by far the largest majority of these didn't make the required 25 minimum and by the rules of the contest, we were compelled to let them go unrewarded. Twelve qualified for prizes.

A couple of fellows got over 20 (why, oh why didn't they send in just a couple more so we could qualify them), eleven more between 10 and 20, twenty between 5 and 10, forty one between 2 and 5 and thirty four who got but 1 sub each. Yet each and every one of them helped QST and the A.R.R.L. along just that much and we hope they will live to see and conquer the next contest sometime between now and the next hundred years. The grand total of all subs received up to the time of closing the polls was 934. Again we say, FB all hands, and a whole flock of tnx for your great work!

Our Christmas Number

This month's QST sees the greatest number of pages we've ever printed, fellows; it has cost us several hundred dollars more but—Xmas is coming and we want to give you a well filled issue for a present. We are wkg nite and day to keep QST the premier amateur publication. In return, we *must* have the whole hearted support of our members and readers.

Advertising supports the magazine and

makes possible the large number of depts with a wealth of reading matter; advertisers depend on your patronage to make their investment pay. Therefore, it's up to the gang to keep behind QST, to everlastingly push QST, to patronize QST's advertisers and to tell your friends about QST with a subscription blank ready to flash at the psychological moment.

MERRY XMAS & HAPPY NEW YEAR

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



All Set!

WHEN this issue of *QST* reaches our readers but a few days will remain before the start of the greatest event in the history of amateur radio, the Third A.R.R.L. Transatlantic Tests. The arrangements are almost completed at this writing, and we are sure we are going to be vastly successful, barring perfectly rotten weather. In the next few days thousands of amateurs, both in this country and abroad, will be putting the finishing touches on their transmitting and receiving set, preparatory to this season's classic.

Now we have a message for you, men. These tests are at once an opportunity and a duty. An opportunity to show our prowess, to enjoy our great game of amateur radio, to get personal records for the efficiency of our individual sending and receiving sets, and to increase the strength and prestige of our A.R.R.L. And by their very happening, these tests also carry to us a big burden of responsibility. We must make them a success and we must conduct ourselves in an orderly manner, or their value is worse than lost. The message of the month, then, fellows, to all U.S. and Canadian amateurs:

Get in on the transmission periods. Do your part; don't miss this chance to have your signals heard over bigger distances than you have ever accomplished before. Remember that 5- and 10-watt sets were heard in Britain last winter and that quite a few signals were copied this year in the prelims. But play the game fairly; follow the schedule carefully, transmit when your district sends and don't slop over; shut down when your time is up and give the other fellow a chance. Remember the novice listeners, too, and explain to them that the unusual QRM is a temporary thing. They will understand, when they are told that we're putting our signals over to Europe.

And then the reception tests, the last ten nights! To us the receiving effort is the most interesting. It will be brand-new amateur history, and more far-reaching in the influence it will have on the advancement of regular international amateur communication than any of us can visualize today. Do you realize that for the very first time in history there will be some

powerful British and French amateur stations trying to talk to us? We *must* copy them, fellows. Copy them and open the door to regular two-way transoceanic work, or get the grand raspberry from all the world. To copy them involves three things: the apparatus; the ability and persistency; and co-operation amongst ourselves. We have the apparatus and we know we're born operators, we American and Canadian hams, and we feel sure that signals are going to be heard on ordinary regenerative tuners. So we must stick at it, night after night, and copy everything we can. The British amateurs did it last year and we must do it this year or admit they are better men than we, for their transmitters promise to be plenty good enough.

The other thing, the main thing necessary for our success, is co-operation among ourselves. The amateur air in North America must be absolutely quiet during these tests. We are all going to make "ether-combers" out of ourselves, and during the test hours on each of the ten nights, thousands and thousands of operators will be straining their tubes and ears and bending every faculty to the search for the faint signals from far-off Europe. What a wonderful opportunity it is going to be for an amateur! Do you realize that 200 meters hasn't been quiet in this country since we first heard of wave lengths? And now our great organization is bending its effort all over the country to a real piece of co-operative work—the silencing of the amateur ether in order that the signals of our European comrades may be received, in order that we may repay them for their kindness in making records for us last year. Let us get into the spirit of this thing thoroughly, fellows. Let it not be said of us—oh it *must* not—that we failed to copy Europe because our men wouldn't play the game and refused to keep quiet air. Let not one solitary individual mar the perfect working of amateur radio. We want the air ABSOLUTELY quiet for the listening periods, as one transmitter can spoil the chances of his entire section of the continent, and we shall require of our members absolutely the fullest measure of the co-operative spirit for which our great League is famed thruout the world. Remember that not all of the amateurs of

the country are members of the League, but we ask their co-operation too and invite them to participate in the tests. Tell them the story and enlist their aid. Amateur transmission during these international tests can be interpreted as nothing short of a QST to the world that the sender is either ignorant or a rotten sport. We don't want to be considered either. Let us play the game, and get our neighbors to do it with us.

Full power in the first ten days; absolute quiet the next ten; and the highest embodiment of the spirit of team-work; *and success is ours!* Best o' luck, O.M.!

K.B.W.

A Nuisance

SAY, who is this station CQ, anyway? Every night we hear hundreds of fellows trying to connect up with him, and very anxious they are to do it because they call him many times; in fact, it's somebody so important that they risk violation of the law and call ninety times and sign every five minutes and so on. And they never get him!

Where's the end to this thing, gang? We thought we saw the demise of useless CQ-ing in our last April Fool's Day Party but it is much like burying the Hon. John Barleycorn. It's getting worse now every night, and the C.W. stations in particular are flagrant offenders. It's an easy bet that 50% of our QRM is caused by foolish CQ-ing. The wild wails of the CQ Hounds are delaying traffic, busting up actual communication, jamming concerts, burning up wasted juice, and making monkeys out of the sending operators.

The CQ call should not be canned altogether but its abuse should be stopped at once. CQ is an international abbreviation, designed to enable a ship to determine what land or ship station is nearest to it to receive its traffic. It was never meant as a general QST and it has no business being used in that connection. We believe that the moderate use of this signal in connection with traffic *on hand to move* is very valuable and helpful, as for example, "CQ msgs NYC" or "CQ tlc east," and we recommend its use in short calls with the sending station's call frequently interspersed. Used in this manner we have found CQ a most helpful thing, and it has helped us to move traffic at times when we have completely failed by trying to raise certain stations we heard—they were QRW but others in the locality we wanted were QRX and answered.

But this is the only proper way to use CQ. It is disgusting to hear stations call CQ so many times one can't keep track of them, fade in and out several times

before they sign off (or do they ever sign?), and then start all over. See here, you CQ Hounds: amateur radio is a busy game and we can't spend ten minutes waiting for one call sign. And does it never percolate thru that ivory top-piece that if your signals are reaching out at all, they'll be heard in the first short call, so that all the other wrist-exercise is just a plain nuisance that the rest of us don't propose to put up with? Cut it out, you—you're spoiling the game.

Understand, now, we're not demanding that CQ cease, but it should be used mainly by stations who have traffic to move. The other fellows with empty hooks should QRX and listen for the CQ's of fellows who have messages in their direction, and get *their* opportunity to work by answering and taking the traffic. The day has passed when we can grant one man the joy of burning up umpty-ump minutes with an interminable wail, and we think good amateurs should refuse to answer such wild calls. If the situation doesn't speedily improve we will consider it our duty to start a Morgue of "dead ones" who fraternize with this CQ-call, with a report of just how many times the nuisance-call was used, so that all the rest of us may judge what kind of birds these ether-burners are.

Down with dumb-bell CQ-ing!

K.B.W.

About This Lid

LAST month we proposed a division of hours in crowded communities as a remedy for interference between amateur transmitters and novice listeners. Of course if there isn't any interference there is no need for division. And that leads us to say a word about C.W. transmission.

The right kind of C.W. won't interfere. Where it would be really brutal to open up on a big spark earlier than an hour at which broadcast listeners had had ample time to enjoy their evening, the quiet C.W. can work the evening thru without bothering anyone. We wouldn't be at all surprised to know that this fact has had more to do with the conversion of spark owners to C.W. than has the inherent technical advantages of the latter method! Starting promptly at dusk there is a flock of C.W. stations on the air, and by the time you have neatly stored away your evening meal and slipped on the cans they are all there, chirping away in quiet efficiency, bothering no one, and getting thru. Any sparks? Almost none! Many an evening we've listened from 7 to 10 and logged a hundred C.W. stations in many districts, and in that time heard not over two sparks. Decency really requires the sparks to observe a time division as proposed in our editorial columns last month, and C.W. sets using unrectified A.C. on the plate are almost in

that class; but the filtered C.W. sets have things their own way and their owners are benefitting by their foresightedness—they can work right now like we used to do with our big sparks in the Nights of Yesteryear!

So the point isn't so much that we must have hours in which amateurs shouldn't transmit as it is that, in recognition of the big number of people who want to listen on 360 meters, there should be hours in which we don't *interfere*. The test for determining whether any station or class of stations should be permitted to work all evening long is to be found in the answer to this question: does its operation interrupt broadcast reception? The local clubs of the country are the ones to determine this, and we are proud of the way they are taking hold of the problem.

Every time we write an editorial about C.W. we receive a flood of classified ads offering spark sets for sale. We're not trying to drum up business now but we ask you, who wants a spark set when they have to wait until 10:30 to open up and when with a couple of bottles they can start at 7 o'clock?

How happy a solution it would be if all our stations were like that! Then there would be no need for formal local agreements. Some cities are that fortunate right now, and of course in these cases there isn't any need to get the radio public together to propose dividing hours. It's ever so much better to avoid these formal restrictions if possible, and in some towns we know the necessity for it has been eliminated completely, by both the amateur and the novice agreeing to be decent about the matter. The situation looks a whole lot better today and we are sure that it will take care of itself if our members will be guided merely by the policy that the broadcast receivers should be permitted to copy without interference during the hours of the evening which count with them.

K.B.W.

National Radio Week

D ECEMBER 23d to December 30th, inclusive, is National Radio Week, a time in which all the friends of radio are asked to boost it. Will you do your share?

The purpose of National Radio Week is to stimulate interest. The broadcasting stations are going to put on special programs and the listeners are going to get their non-radio friends over to their sets and show them. "Get another fan if you can" is the slogan. And "Make this a Radio Christmas." Radio can be given a big boost, the number of enthusiasts doubled, and some life put into radio business. In fact the success of Radio Week will probably give as merry a Christmas to the poor dealer as anyone else.

Now if all these people can help to boost radio during this week, how much more we amateurs can do! Of course we do all the time, but let's try harder during this particular week. There is someone that each of us can tell about the possibilities of radio and thereby bring into the fold; within the reach of all of us is a novice listener who needs a helping hand; and all around us are folks whose interest in radio, in order to continue, demands that they be told about *amateur* radio. What better service can we, the amateurs, do than to find those of our novice neighbors who are beginning to drop out because the broadcasts no longer are interesting, and explain to them the limitless possibilities of amateur work, the branch of radio in which the *real* fun is to be had? We can't go out and get new broadcast fans but we can do even better, by preventing the making of a knocker and converting the right men into enthusiasts of the kind that count.

Make another amateur if you can!

K.B.W.

Broadcast Stations Co-operate

W FAA, the Dallas News and Journal broadcast station on Tuesday, Thursday and Saturday nights has been running an hour's program, 11 P.M. to midnight. When the A.R.R.L. announced its tests schedule on the Transatlantic Tests, WFAA requested WRR, the City of Dallas station, to help them out of a hole. WFAA had already made arrangements for their artist for several weeks in advance and did not want to get in a mix-up nor did they want to broadcast during the A.R.R.L. tests. WRR gladly came to the rescue when they found that the amateurs were to derive the benefits, and gave WFAA their 8:30 to 9:00 P.M. time on those nights in order that WFAA might run its musical schedule from 8:00 to 9:00 instead of from 11 to 12 during the tests, WFAA already having 8:00 to 8:30 as their schedule. In addition to changing their schedules to help the amateurs during the ten-day test, both WRR and WFAA made several announcements concerning the changes and stating they were made, gave the schedule of the various districts, told their listeners just what the tests were for and asked them to consider when hearing so much telegraphing during the ten day test that to the amateur radio men and to the A.R.R.L. in particular they were indebted in a large measure for the present development and high efficiency of radio apparatus.

To WFAA and WRR and the radio staff of each station the A.R.R.L. is indeed indebted. They are both A.R.R.L. members being true members they showed the spirit of co-operation.

F.M.C.

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



Of particular interest is our message traffic report for this month. It begins to bear fruit as result of our extensive re-organization plan which was started some time ago.

In spite of the fact that 610 A.R.R.L. Official Relay Stations reported, we have plenty of room for many others, and those A.R.R.L. members who have stations capable of handling traffic are invited to communicate with the nearest assistant division manager whose address appears on page 3 of this issue. We want more men and stations, but we want good reliable ones.

Traffic honors for this month go to a C.W. station again.

* L. E. Furrow, 8FT *
* Troy, Ohio *
* Central Division *
* 561 messages *

TRAFFIC REPORTS FROM A.R.R.L. OFFICIAL RELAY STATIONS

CENTRAL DIVISION—C.W.: 8FT, 561; 9II, 552; 9UU, 214; 8ZAG, 157; 8AIM, 139; 9CP, 120; 8BDO, 118; 8IJ, 146; 8ZZ, 118; 9AJH, 107; 8AXB,

Message Traffic Report By Divisions OCTOBER

Division	Stns.	C.W. Msgs.	M.P.S.	Stns.	SPARK Msgs.	M.P.S.	Stns.	TOTAL Msgs.	M.P.S.
Atlantic	99	3037	31	46	1472	32	145	4509	31
Central	72	5175	72	37	1469	40	109	6644	61
Dakota	23	1514	66	5	89	18	28	1603	57
East Gulf	31	1668	56	13	779	60	44	2447	55
Hawaiian	1	24	24	1	6	6	2	30	15
Midwest	46	2621	57	19	862	46	65	3483	54
New England	28	2314	83	11	515	47	39	2829	72
Northwestern	13	336	26	10	282	28	23	618	27
Ontario	17	295	17	2	46	23	19	341	18
Pacific	31	627	20	23	572	25	54	1199	22
Roanoke	36	2158	60	3	356	119	39	2514	64
Rocky Mountain	11	667	61	3	40	13	14	707	50
Vancouver	2	36	18	5	91	18	7	127	18
West Gulf	12	826	69	5	40	8	17	866	51
Winnipeg	2	58	19	3	8	3	5	46	9
Total	424	21336	50	186	6627	35	610	27963	46
C.W. Messages,	21,336—76%								
Spark Messages,	6,627—24%								
Total,	27,963								

We present a new baby—the Hawaiian Division and its report. Watch it grow!

Among the divisions which have showed a decided increase in traffic we find the East Gulf, Midwest, New England, and Ontario Divisions. The Roanoke still holds its enviable position with the others.

No doubt, the Trans-Atlantic Preliminary Tests will cut into our traffic for next month, but we must keep after that 50000 mark. Its our aim, men, and nothing short of that will be acceptable.

98: 9AAP, 44; 8CGX, 94; 9CCM, 78; 9DCR, 68; 9AFN, 66; 9DQU, 136; 9DFB, 64; 9BHD, 63; 9DVW, 60; 9APS, 378; 9BJT, 59; 8AB, 56; 9DDY, 55; 9BLC, 52; 8ZF, 52; 8QK, 59; 9ALW, 50; 9AIU, 46; 8ZAF, 44; 8CAZ, 42; 8ANB, 38; 9ASD, 34; 9BIZ, 32; 9BTA, 30; 8CMI, 26; 9DBV, 26; 8AWU, 23; 8BGL, 22; 9AMQ, 32; 8BNH, 17; 8BJC, 16; 9BCH, 10; 8BRO, 14; 9DJO, 14; 8AND, 11; 9DYN, 11; 9BRK, 10; 8CAK, 7; 8BYF, 6; 9AKU, 6; 9EJ, 5; 8YN, 6; 9BAW, 5; 8AZF, 5; 9BLU, 5; 9ALR, 4; 8BWS, 4; 9ARM, 4; 8AQC, 2; 8FI, 2; 9CLZ, 1; 9CSK, 1; 9BAC, 1; 8BE, 10; 8BWA, 105; 9BAC, 1; 9ALR, 4; 9DCU, 2; 9BLC, 2; 8YR, 7; 9ZN, 412; total, 5175. Spark: 8AUX, 212; 8AWU, 200; 8AIZ, 174; 8UC, 133; 8EB, 74; 9WX, 74; 8CMI, 69; 8BXC, 57; 9ME, 44; 9CP, 37;

9AVK, 33; 9DHz, 30; 9ASJ, 27; 9BV, 23; 8CGX, 18; 9MC, 16; 9DEL, 16; 9CA, 14; 8BAH, 14; 9DGX, 32; 8CKV, 14; 8FT, 10; 9DHC, 28; 9BHR, 10; 8FL, 8; 8BEJ, 14; 8ZF, 6; 9DWM, 6; 8YN, 4; 9CIV, 3; 9DXG, 3; 8ZF, 2; 9AFK, 33; 8DEL, 15; 9DXT, 3; 9YB, 10, total, 1469.

DAKOTA DIVISION—C.W.: 9AUL, 19; 9BJV, 83; 9AJP, 21; 9BOV, 5; 9GD, 12; 9DGE, 15; 9DR, 408; 9AUA, 101; 8AWM, 317; 9BKP, 45; 9BBF, 15; 9BTT, 57; 9BKJ, 30; 9YAJ, 190; 9APW, 125; 9BAV, 4; 9AOR, 14; 9ADF, 2; 9EA, 2; 9YW, 14; 9ASF, 11; 9AVZ, 8; 9BRI, 16; total, 1514. Spark: 9FH, 1; 9PN, 8; 9ZC, 32; 9DKQ, 30; 9BOF, 18; total, 89.

EAST GULF DIVISION—C.W.: 4BF, 102; 4JY, 76; 4LZ, 32; 4JZ, 18; 4LH, 12; 4BQ, 202; 4IV, 51; 4MN, 70; 4EB, 421; 4HW, 101; 4KF, 87; 4CY, 26; 4KU, 12; 4CG, 15; 4MB, 10; 4KM, 3; 4AS, 35; 4BY, 78; 4EL, 78; 4GE, 1; 4LA, 10; 4FQ, 58; 4JK, 51; 4KI, 15; 4FE, 16; 5XA, 55; 5UQ, 18; 5ADE, 6; 5ZAS, 1; 5XAE, 8; 4XK, 5; total, 1668. Spark: 4QT, 17; 4MZ, 10; 4FB, 146; 4HS, 204; 4BI, 22; 4MY, 88; 4ON, 10; 4BW, 8; 4FD, 26; 4GN, 24; 4EG, 94; 5XA, 129; 5XAE, 1; total, 779.

MIDWEST DIVISION—C.W.: 9EX, 12; 9CFI, 31; 9BHN, 30; 9CCV, 34; 9DEF, 4; 9CKM, 20; 9ANQ, 76; 9ADG, 274; 9DUN, 75; 9DS, 75; 9ABV, 102; 9CCS, 12; 9AON, 327; 9DXN, 12; 9CTR, 17; 9BEN, 176; 9AQZ, 32; 9FM, 84; 9DZY, 118; 9BDS, 18; 9AAU, 6; 9YM, 20; 9AQR, 21; 9BCR, 5; 9DJH, 1; 9AOU, 141; 9PSZ, 120; 9ARZ, 118; 9BHG, 85; 9DKY, 62; 9DZ, 65; 9FK, 44; 9AMI, 32; 9CLQ, 41; 9BCF, 27; 9DSL, 15; 9HK, 45; 9DMH, 15; 9DVI, 6; 9CES, 18; 9YU, 50; (9DSM, 9ATC, ADT, 9EW, 9VE, 175), total, 2609. Spark: 9PS, 23; 9DCW, 17; 9YM, 20; 9RR, 75; 9AHZ, 2; 9BKK, 21; 9DJR, 19; 9BMN, 152; 9ANO, 36; 9FK, 22; 9HK, 36; 9CS, 20; 9FK, 32; 9DNC, 83; (9DSM, 9ASO, 9DPB, 9CGS, 9HG, 300), total, 826.

NEW ENGLAND DIVISION—C.W.: 1CBP, 41; 1GV, 177; 1BKQ, 223; 1FB, 146; 1SD, 82; 1II, 88; 1CPN, 220; 1QP, 71; 1AJU, 42; 1IV, 35; 1ZE, 210; 1XM, 177; 1CUT, 32; 1CJD, 28; 1ADN, 51; 1BRQ, 109; 1AXB, 16; 1ASF, 172; 1RVH, 16; 1AGK, 42; 1BDU, 15; 1AGH, 50; 1AYQ, 45; 1AW, 46; 1AYU, 57; 1BOQ, 14; 1BIY, 9; total, 2314. Spark: 1BVB, 67; 1AHT, 2; 1AW, 21; 1BIK, 11; 1CNI, 264; 1LZ, 40; 1BRG, 7; 1BJS, 17; 1CR, 23; 1AYU, 13; 1BOQ, 40; total, 515.

PACIFIC DIVISION—C.W.: 6CC, 19; 6ATC, 12; 6BV, 21; 6FH, 56; 6EC, 2; 6ZR, 3; 6AJH, 40; 6BJY, 30; 6XAS, 2; 6APW, 42; 6BKB, 12; 6AK, 10; 6ZX, 31; 6CU, 47; 6BPZ, 5; 6BQC, 12; 6ALU, 32; 6BRG, 5; 6EB, 20; 6FA, 50; 6BJC, 8; 6BQZ, 6; 6BJX, 16; 6BQG, 2; 6BEG, 10; 6JD, 18; 6KA, 20; 6FT, 22; 6EN, 48; 6SR, 28; 6ZD, 6; total, 627. Spark: 6CC, 42; 6TC, 6; 6TU, 44; 6FH, 20; 6AHF, 60; 6AJH, 31; 6BJU, 37; 6BBD, 15; 6BPZ, 40; 6IU, 6; 6AWI, 9; 6UP, 55; 6KE, 15; 6AIC, 8; 6GI, 20; 6ADG, 1; 6PL, 3; 6ADL, 50; 6OD, 33; 6ALD, 12; 6BAJ, 5; 6AAK, 32; 6OL, 28; total, 572.

ROCKY MOUNTAIN DIVISION—C.W.: 9ZAF, 173; 9AMB, 138; 9DTM, 88; 9XAQ, 13; 8DTE, 43; 9BXA, 7; 7AFW, 3; 7LU, 130; 7ZO, 53; 7ZV, 5; 9ATQ, 14; total, 667. Spark: 6BKE, 21; 6ATH, 10; 6APL, 9; total, 40.

WEST GULF DIVISION—C.W.: 5IX, 101; 5VA, 49; 5ZH, 37; 5SF, 165; 5DI, 120; 5QI, 10; 5XY, 12; 5RR, 6; 5VO, 3; 5XV, 37; 5XAD, 60; 5ZA, 226; total, 826. Spark: 5ZC, 6; 5YK, 10; 5ZAE, 18; 5HC, 4; 5AEW, 2; total, 40.

WINNIPEG DIVISION—C.W.: 4HH, 16; 4BV, 22; total, 38. Spark: 4AS, 3; 4CE, 3; 4EZ, 2; total, 8.

ATLANTIC DIVISION—C.W.: 2CGS, 24; 2RFE, 3; 2CKL, 29; 2AFP, 73; 2AJF, 15; 2AJA, 36; 2BHR, 55; 2DOI, 6; 2BNZ, 97; 2ALY, 58; 2CMS, 20; 2HW, 10; 2ANM, 20; 2AJW, 26; 2BRC, 137; 2AWS, 69; 2AZC, 28; 2BSC, 18; 2BJO, 7; 2KPF, 20; 2BQS, 4; 5BIP, 12; 8XI, 2; 8AOB, 23; 8KU, 6; 8PJ, 6; 8QB, 9; 8MZ, 37; 8UE, 30; 8APL, 30; 8CTK, 1; 8AUA, 10; 2CMQ, 50; 3CG, 40; 2AFC, 61; 2FC, 61; 2CGK, 18; 2OF, 34; 2BJP, 8; 2AER, 22; 2AOS, 8; 2AEJ, 12; 2BNI, 22; 2ARQ, 4; 2AWF, 44; 2NZ, 224; 2TS, 21; 2AVE, 63; 2BRK, 43; 8AHK, 7; 8CSE, 8; 8CU, 11; 8ATU, 39; 8NB, 47; 8AXN, 111; 8HMM, 43; 8BUX, 38; 8ASL, 37; 8CTN, 25; 8AM, 48; 8QB, 12; 3FR, 26; 3RLU, 8; 3ZO, 116; 8HIQ, 6; 3BNU, 150; 3LP, 54; 3MB, 52; 3GK, 18; 3VW, 23; 3FM,

3; 3ANJ, 37; 3SM, 30; 3ZE, 24; 3OW, 3; 3BJX, 15; 3AGO, 34; 3AIO, 65; 3AKW, 5; 3CON, 45; 3ALT, 11; 3AJD, 46; 3HG, 40; 3APT, 4; 3PZ, 45; 3BHM, 57; 3ALN, 27; 3IL, 27; 3QV, 33; 3FS, 22; 3BU, 16; 3AGR, 20; 3CNU, 4; 3JJ, 4; 3OD, 6; 3LR, 35; 3ZW, 8; 3BPF, 3; total, 4575. Spark: 2BQZ, 19; 2AJA, 8; 2OM, 140; 2SQ, 119; 2CJX, 64; 2KK, 80; 2AXK, 40; 3JL, 10; 3CDK, 56; 2BSC, 11; 2BJO, 7; 2UA, 80; 2AEO, 41; 2DI, 163; 2CEV, 49; 3BOW, 5; 3BZU, 4; 3CEB, 3; 3KU, 6; 3MZ, 2; 3AXQ, 5; 3AAW, 65; 3BM, 44; 3CHY, 5; 3COA, 3; 3CAD, 12; 2ARS, 26; 2MN, 6; 2AEF, 30; 2AAF, 21; 3CS, 5; 2ARB, 48; 3AYM, 24; 3BQA, 31; 3CUG, 4; 3ZS, 8; 3QN, 24; 3UD, 46; 3CEJ, 51; 3ZD, 55; 3HY, 2; 3VII, 19; 3CDI, 12; 3AC, 29; 3KM, 4; total, 1395.

NORTHWESTERN DIVISION—C.W.: 7ADP, 7; 7AGF, 24; 7AGV, 6; 7DP, 86; 7BV, 15; 7LY, 6; 7LR, 19; 7NN, 28; 7OE, 16; 7OO, 6; 7SC, 42; 7TH, 26; 7TQ, 14; 7WM, 56; total, 336. Spark: 7AW, 27; 7BG, 23; 7BK, 90; 7FR, 8; 7GE, 47; 7CH, 12; 7IM, 25; 7NC, 2; 7OJ, 27; 7TW, 21; total, 282.

ONTARIO DIVISION—C.W.: 3ACJ, 2; 3XX, 2; 3KP, 19; 3GK, 4; 3JK, 6; 3JL, 61; 9AL, 84; 3CO, 8; 3JT, 3; 9AW, 1; 3KO, 17; 3DS, 26; 3YH, 2; 3DH, 45; 3JE, 2; 3SX, 5; total, 295. Spark: 3FO, 27; 3CE, 19; total, 46.

HAWAIIAN DIVISION—C.W.: 5ZAC, 24. Spark: 6ZAC, 6.

ROANOKE DIVISION—C.W.: 8SP, 174; 8AFD, 37; 8AUE, 30; 8BPU, 20; 8CAY, 5; 8AMD, 2; 8BKE, 32; 4OI, 86; 4EA, 180; 4FT, 252; 4BX, 167; 4NT, 97; 4ID, 15; 4DC, 13; 4DQ, 10; 4NV, 4; 4EN, 6; 4GH, 134; 4KC, 63; 3MK, 284; 4LJ, 50; 3ZZ, 126; 3APR, 11; 3BIJ, 101; 3CA, 62; 3BMN, 29; 3AEV, 43; 3AUU, 22; 3IW, 20; 3BVL, 19; 3UZ, 18; 3BHL, 17; 3BLF, 5; 3MO, 3; 3SK, 1; 3TJ, 10; total, 2514. Spark: 8BDA, 348; 8IC, 4; 3AOV, 4; total, 356.

VANCOUVER DIVISION—C.W.: 4DQ, 23; 6CR, 13; total, 36. Spark: 5DX, 55; 5CN, 31; 3EC, 3; 9BD, 1; 5EJ, 1; total, 91.

ATLANTIC DIVISION

C. H. Stewart, Mgr.

EASTERN PENN.: Traffic in general has taken a decided increase over previous reports and more stations are reporting due to the efficiency of the Form No. 1 which was supplied to the various recently appointed official relay stations. Section No. 1: The D.S. is steadily increasing his list of stations for appointment as relay stations and reports good work being done by 3AWH, 3AWF, 3BUL, and 3AKR. No. 2: Owing to the failure of D.S. George H. Wise, of this district to forward reports since his appointment, it was necessary to cancel same. The new D.S. for Second Penna. District is Oscar A. Hiskey, 3BNU, Bethlehem, Pa., formerly city manager, who will take care of all relay work in this section. Mr. Hiskey has shown excellent work in traffic handling and organizing his city. No. 3: No report. Scranton is well represented by the following stations: 8RH, 8AJA, and 8BIQ, who is city manager. No. 4: The D.S. only reports the messages of 3ZO. We would like to have reports from the various towns in the 4th who we are sure have done good work. 3LP has two operators on the job in clearing traffic. No. 5: No report received from this district. Unless some action is forthcoming from this district some change will have to be made. There are numerous stations in this district doing very good work, but no reports have been received. Credit cannot be given to the district un-

less the stations come across with their reports. Harrisburgh, York, and Lancaster are large traffic centers and we need their reports. No. 6: According to the D.S. this district was void of traffic this month, but many stations are under construction that should prove efficient in handling DX traffic. 8ANE has 10 watts of C.W. going, and has expectations of increasing it to 100 watts. Louisburg Radio Club installed 5 watts of C.W. 8BIR's spark is waiting the arrival of a new condenser. 8XN is having trouble getting adjusted to his special wave, and probably a new antenna will help. 8DT is installing C.W. and locating new stations in Williamsport. 3FR appears to be the only DX station in Allentown, all others have turned to the broadcasting craze.

PHILADELPHIA: Philadelphia is showing more pep than ever before. We desire to thank those stations who have shown interest enough to make out reports and push things along in general.

Section No. 1: Successful relay work has been accomplished by 3VW, 3KD, 3GK, and 3FM. 3HX building a new receiver. No. 2: Stations desiring appointment in this district communicate with city manager, D. C. Boggs, 147 Pelham Rd., Germantown. No. 3: 3ANJ has increased to 100 watts C.W. and is very consistent at 200 miles. Let's have reports from more stations in this district. No. 4: 3FS, 3QV, and 3SM, are the only stations doing DX work. These are regularly on the job. The city manager has other prospects in view.

A note of warning is sounded to all traffic officers who fail to make out their monthly reports. This means a cancellation of their appointment as we cannot afford to lose the individual station report sent to them each month and cast aside. Co-operation is needed from each and every station, so let's have that traffic report on time.

WESTERN PENNA.: State College is now on the air with $\frac{1}{2}$ k.w. C.W., and will have a report for the coming month as they maintain continuous 24-hour watch.

DISTRICT OF COLUMBIA: It looks like a hot time in the old town this winter. Already things are buzzing quite lively and there is talk of three times as much. 3KM threatens us with a coffin and sink gap, and then builds a receiver that will pick up nothing but C.W. 3ZW hopes to reach 6ZAC with his new 500 watt C.W., and we think he will. 3LR is doing great work and is using a two foot loop exclusively for traffic work. There are a number of 10, 15, and 50 watt sets working very nicely. 3BHM has worked 6XAD with a 50 watter. If we only had another 3ZY this winter, traffic wouldn't know it had stopped in Washington. 3JJ opened up with two 50 watters and after considerable trouble with bad tubes, managed to get out in good shape.

MARYLAND: Baltimore stations are lining up for real relay work for the coming season. Practically all of the old DX fellows are on the job, and many new ones are heard nightly clearing traffic. 3AC has forsaken the rock crusher at last. He is now doing still better work on a 5 watter. 3AJD continues to be the most consistent Baltimore C.W. station. His 15 watts apparently carrying equally well in all directions. 3UC has overhauled the old spark and should do good work. He still has a bad case of his old CQ-itis. 3EM will be on with a new 50 watt outfit soon and may increase later to 100 watts. 3APT has moved to the suburbs and has already reached out nicely. 3WF has been ill, and is temporarily out of the game. 3SQ and 3BUC are capable of real DX, but are not on often. 3HG has been struggling to keep traffic moving with one 5 watter until a larger set can be installed. The A.D.M. is unable to line up any stations outside of Baltimore, and is anxious to get in touch with any DX men in other parts of the state who are interested in A.R.R.L. work. Letters should be addressed to George L. Deichmann, Jr., Park Heights and Bancroft Park, Baltimore, Maryland.

NORTHERN NEW JERSEY: 2AWL feels justly proud of the fact that he received a report from each district superintendent under his supervision. Some reports from city managers are short but this is because of late appointments and vacancies still existing. Traffic is picking up and moving fast. A number of our best stations who helped move summer traffic are closed—operators being away to school and college. 2BQZ burned out his transformer but will be back stronger than ever as he has no OW now and says he will have more "jack." 2OM in operation only 10 nights out of past month, cleared 140 messages and could have handled more but for the fact that too many stations jam things in with CQ's and unnecessary sending.

EASTERN NEW YORK: Dr. Cyriax reports on account of work attached in appointing the district superintendents and city managers in this section, reports have been deficient. A large number of the stations have just been appointed, so that reports from them are incomplete. Newly appointed officials promise better reports next month. H. S. Colins, 2AJW, our Long Island district superintendent, has turned in a splendid report from stations in his section. 2UA, Decker, reports his section in bad shape and requests co-operation from all stations throughout his territory, and hopes to have the old Hudson River bunch at it again soon. (Lend him a hand men FBO). Staten Island shows plenty of pep with station 2NZ, Elmer Roy Raguse, taking just honors for the month with 224 messages, leading the Northern

section. Reports from Brooklyn are missing.

WESTERN NEW YORK: Mr. Benzee's report is very gratifying as the same conditions exist in his sections as in 2DI's. Some big traffic stations operate throughout western New York, the only thing necessary is to get them to report. Reports from Utica indicate that everybody in that town is reconstructing their transmitters. We regret to learn that 8AWP of Syracuse has procured a divorce from the amateur game and is now a full fledged broadcaster as WLAH (we have still heard 8AWP on 200 meters, and we also doubt very much if we will loose him entirely FBO). 8AXN leads western New York with 111 handled on two 5 watters, which is excellent work. Olean, N. Y. is well represented by a raft of DX stations. 8BUX one of them, on 50 watts, has been reported by 6XAD and hopes shortly to be QSO for traffic to him. If there are any stations in Allegany county will they please make themselves known. Chas. Nichols, turned in only a slim report, but says he has dug up a number of stations now who promise to show something next month.

Traffic Report. Northern New Jersey leads my section with 1437 messages handled. Eastern New York second with 1113. Western New York third with 798—a grand total of 3348 messages. For the northern section you will note this is a decided increase over last month. Much credit is due 2AWL for the way he has been whipping Northern N. J. traffic in shape.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

This report will be in the nature of a resume of the work of the Central Division so far this fall.

OHIO: Ohio handles the bulk of the Central Division traffic. An excellent organization exists in this state, which includes a great many high class long distance stations. The report was received too late from district 1. A nice report was received from 8QK, formerly 8AFY. QK uses C.W. and phone. No report from district 2, but individual reports arrived from 8IJ and 8CMI who are both doing good work. 8IJ handles considerable traffic with 8FT on daylight schedules. 8CMI, will report on Marion stations and their traffic until the district superintendent wakes up enough to take charge of his duties in collecting traffic reports. P. A. Marsal, superintendent of district 3, reports that many of the relay stations in his district seem to have gone south or west or somewhere during September as he received only four message reports. District 4 seems to be the most wide awake of any part of the state. Although hindered very much by the many broadcasting stations

which are on continuously from 7:00 A.M. until 1:00 A.M., the district stations have managed to handle a nice bunch of messages, and the best of it is that they report their traffic too. Cincinnati radio clubs are livening up again after an all summer shut down. Greenville is showing some signs of life. Several new stations are blooming forth and will soon blossom into full fledged relayers under the able guidance of district superintendent L. E. Furrow. 8FT has been doing most of his relay work on C.W. since his spark set was partially broken down and could not stand heavy traffic handling. District 5 has very few stations outside of Columbus. The Columbus stations are doing good work but they are getting a little lax in reporting their work. Only two stations this month turned in their reports to superintendent M. F. McDowell. 8TJ has just completed a new station in a better location.

INDIANA: In Northern Indiana, the assistant division manager has been confronted with a problem that has existed in northern Indiana since the formation of the League. The stations there are few and widely separated due to the fact that all the towns are rather small and in addition this year he has had the added handicap of a great many of his better operators having gone away to college leaving only a very few good stations in operation. E. E. Pippenger, Goshen, Ind., is now attending Purdue University, address 208 Wiggins St., West Lafayette, Ind. No October report due to change of address from Goshen to Purdue. On the job at 9YB and working up his end of the state. No reports from Ft. Wayne pending the appointment of a new city manager there. 9CP is doing good work with both spark and C.W. Other active stations are 9DTJ, 9AIU and 9BLC. 9BLC is in the hospital. 9CP clears most of the DX traffic, while 9AIU clears most of the Indiana dope. The following operators are at Purdue University: 9FS, 9DEK, 9VL, 9AGR. In Southern Indiana approximately the same condition exists as in northern Indiana, the large cities apparently being dead as far as radio relay work is concerned. J. E. Hall of Seymour, Indiana, newly appointed assistant division manager for southern Indiana has not had time to work up his territory or get in a report as yet.

MICHIGAN: The Upper Peninsula has been dead, but the southern Peninsula with Detroit and other large cities, has been very much alive and especially active. The Special wave length route has been organized across this part of the state. We are now organizing a new route from Grand Rapids through the Traverse City thence to the Upper Peninsula, where we have developed a good relay through that territory. A new trans-state route will be in effect shortly via Ann Arbor, Jackson,

Battle Creek and West. We need more day-light schedules.

ILLINOIS: The newly appointed assistant division manager, N. C. Smith, has been unusually successful in putting pep into his organization and renewing the activity which has been allowed to die out for the past few months. 9NQ the only relay station in Galesburg is out of commission on account of condenser trouble. C. M. Schalkhauser reports three stations, 9LF, 9PQ and 9XAF ready for operation. 9AZF, 9DAY, 9RH are all spark but no messages. 9CTF, 9AHQ, use C.W. but not messages. 9AMK, spark, is in charge of Mendota. 9EJ, C.W., is in charge at Carthage. 9BIZ, C.W., is in charge at Toulon. Stations in this vicinity report too much broadcasting after 9:30 P.M. Stations wishing to clear west will find ready outlet through 9AJH. 9CCM is doing remarkable work on one tube with a spark coil attachment. 9DDY, another trick C.W.-squeak-boxer, is working 2AWL on schedule. 9WX spark is fighting power company as well as BC QRM but hands us a good total. 9BTA seems to have a receiver as he is logging 6KA, 6XAD, 6PD and 6BES. Why not some traffic? 9BJT, C.W. handled lots of traffic with ten watts C.W. 9CA, district superintendent, says he is forever blowing bubbles but they are all in the dielectric. Traffic is being handled by 9BYX, 9CLZ, 9CFK and 9ASL. There is lack of interest in traffic handling in Roodhouse. 9ASL is just appointed city manager. No cards came back from official relay stations in Marion. 9AFN has been doing all the relay work of importance during the month. 9BQW has been doing good but not consistent work, and with a double amount of power will do some work this winter. 9DVW still has his single can of TNT, and is making a few fifty watters look sick, getting 300 miles per watt, approximately. Can ya 'magine ut? 9DJO is on with the watts again, and is starting out in earnest. 9BRO canned his spark for a 5 watt and is now bent over the task of telling the world. 9BHD is sure knocking 'em dead with his fifty watts. He has worked every district and Canada during the last month. 9ALW is coming fine. He burned out a half k.w. in the spring and started to monkey around with a couple of bottles. Well, he still has them and hasn't said a darn thing about a spark set for months.

WISCONSIN: B. A. Ott, says that he will have more time in the future and will have a better report for next month. 9ALR with four fivers is on regularly and doing consistent work. 9AFK has broken out with a 100 watt C.W. set in addition to the 1 k.w. spark equipment and has reached both coasts, Canada and the Gulf with one 50 watter. 9DXT has a 1 k.w. sink spark and will soon blossom out with a

50 watt bottle. 9DEL has been on the air consistently and has made a name for himself by his work on the lake shore. 9BAC has a perfectly good 10 watt C.W. set tied up awaiting the erection of a new mast. 9DHK will tickle the air with a five watter. Station 9BDD is operated by Wm. Crouch and owned by the Waukesha Radio Amateur Club (amiliated). Its operating hours are from 4:00 to 10:00 P.M. and any messages coming from the south, west or north for Milwaukee or any other nearby city may be handled through 9BDD. 9YAD is now in complete operation.

DAKOTA DIVISION N. H. Jensen, Mgr.

Recent appointments made in this division are as follows: Orville Wheelon of Pierre, district superintendent of South Dakota (to succeed Charles Norton who has gone to Ames, Iowa), F. B. Christopherson, city manager of Sioux Falls, So. Dakota; E. J. Krusel, city manager of Superior, Wisconsin; M. G. Goldberg city manager of St. Paul, Minnesota.

The D.M. has been almost swamped with letters the past month from amateurs all over the division, reporting amateur activities, reporting about new stations starting, and making inquiry about conventions, trans-Atlantic tests, and other matters. This is an indication that amateurs are still very much alive and that amateur relay work is on the increase. Minnesota district No. 2 did some exceptionally good work the past month.

MINNESOTA: Official relay stations are requested to send in reports, etc. promptly after the 15th of each month to the district superintendent, because he must have his report ready for mailing on the 19th at the latest. Report whether you have handled any traffic or not, as it will help to get a line on what is going on and to get a report on the real conditions in the district.

City manager Hayes of Duluth, 9GW, reports that interest in relay traffic is picking up wonderfully. Duluth now has four DX stations handling traffic, all C.W., and they are on the job, so come on with your traffic. These stations are 9ADF, 9CO, 9GW, and 9EA. A new broadcasting station, WMAT, has started up and is giving some trouble, as he is working on 220 meters. (How come 220 meters?—T.M.) This may pass before 10 P.M. but after 10 P.M. we ask the broadcasting stations to "please note the U.S. Radio Laws." We are trying to keep the air quiet for the broadcasting stations the early part of the night, and are not doing any traffic work before 10 P.M., and if the broadcasting stations would try to co-operate with us, there would be much improvement for all concerned. WJAP, who previously gave some trouble by broadcasting after 10 P.M. is

now a real good fellow. He is off the air after 10 P.M. 9PN has a new C.W. and spark set ready and is pounding out in great shape. 9PN has been worked from 9ZC several times lately, and that is a hard jump to make. The greatest trouble now is to get an outlet to the west coast. 9AOR is still with us and is doing good work. 9BAV has remodeled his station and is going strong.

There are five 250-watt tubes in operation in the Twin Cities at present as follows: 9BLY, 9IG, 9AUL, 9AUJ and 9DGE, as well as 9AWM. Very good daylight routes have been organized out of the Twin Cities. 9ARZ, 9AWM, 9AMI, to the south, 9MF and 9XT to the north, and 9CL to the east can all be worked in daylight. Through 9CL, traffic goes to 9MC and 8UE. Thus, a complete daylight route out of Minneapolis to the east coast. 9DR has worked stations in California seven times the past month and still continues to handle a great amount of traffic with his two fifty watters. 9AWM is doing great work with his 250-watt bottle.

SOUTH DAKOTA: C.W. appears to be crowding the "rock crushers" out. 9BRI with ten watts is doing good work. He has abandoned his spark and works 9AVZ every noon clearing local traffic. 9AVZ is attending school at 9YW and is often heard operating that station. 9YW is doing good work and has been reported in California a number of times. 9AIG is trying to get a five watt to "work" while waiting for his fifty watt tube. 9YAK, 9DKQ and 9BOF are all doing good work, and a new station, 9CGA is reaching out in good shape. Another new station, 9CCY, will be going soon with 10 watts. The second South Dakota Convention will be held at Sioux Falls on December 28th and 29th, 1922.

NORTH DAKOTA: City manager, Bert Wick, of Fargo, 9AEJ, reports that 9GK is doing good work and that this station operates after 11 P.M. on Tuesday, Thursday, Saturday and Sunday evenings.

EAST GULF DIVISION B. W. Benning, Mgr.

GEORGIA: Dist. No. 1: 4BQ has been burning things up this month and has been reported in every state in the U. S. and every province in Canada. 4IV and 4MN are doing good DX work. 4FB is taking OM Pope's place and traffic is pouring through that city. This bunch of stations in district No. 1 are all connected with daylight schedules and the majority of their traffic is handled before 5 P.M.

No. 3: This new district includes the following counties: Fulton, Dekalb, Campbell, Clayton, Henry and Rockdale. This takes in Atlanta and the nearby cities that are handling the majority of the traffic in the state. Message traffic has been pouring through Atlanta lately and in spite of

a continuous broadcasting schedule, the local spark stations are doing good work. The outstanding traffic report of the division comes from 4EB in Palmetto who has been busy with daylight work.

No. 4: Some new appointments have been made in this district during the month. Jones of 4GN is now district superintendent. 4AS has been appointed city manager and reports that things are beginning to pick up in the relay line. 4DH has just returned from the Pacific coast and is getting his new station into commission. 4GN and 4FD are still going strong but are having a hard time on account of various break downs and QRN. 4EL and 4BY have been having a hard time holding things down in Savannah with no help from 4GL. Old Efficiency says he will be on the air by the first of December.

SOUTH CAROLINA: Business is picking up in this state and before many more moons the other states of this division will have to look up to it. 4EG is still working on the personnel and getting his districts in line for winter work. The following stations are all doing good work and are on the air every night: 4EG, 4LA, 4FQ, 4JK, 4KI and 4FE.

ALABAMA: No. 1: 5BQ has established connection with 5XA which is considered quite a feat for this section of the state. 5ZI is changing his location. 5ADE is reaching out nicely and handling traffic, but is not an A.R.R.L. member, and is not keeping a log on his work. No. 3: Traffic is going in and out of Mobile in fine style. 5XAE is on the air with 100 watts C.W. and is reaching out all over the country. They have established connection with 5XA. 5JZ is still fooling away with spark and has actually succeeded in handling one message with this antiquated method.

District No. 4 was made primarily for station 5XA but will later take in enough territory to handle any new stations that might spring up in near-by counties. 5XA is now going in full blast, having all 5 transmitters in operation, and handling traffic on 4 of these. The radio inspector has just left 5XA and all of the operators are in possession of new licenses. A.D.M. McIlvaine says that any station working 5XA and has trouble in copying them to ask for a QSY on 200 meters for spark, 250 meters for 500 cycle spark, C.W. or I.C.W. or 375 for spark. They have the station arranged for quick shifting and no doubt it will prove a blessing for the East Gulf stations who have so much trouble in copying them due to constant swinging.

FLORIDA: More stations are on the air and more messages are being handled. This is partly due to improving weather conditions, but is mostly due to the increased efforts of the men themselves. District No. 1 reports practically nothing doing. 4BP spark has stepped out and

worked some real DX, but has handled no messages. 4EZ is out with a burned out transformer, but promises to be on the air soon. No. 2: This section is showing more activity than ever before. 4BF, 4JY, 4IZ, 4JZ, 4LH, and 4XK, C.W. and 4MZ, spark, are all handling messages, and 4NU has a C.W. station almost ready to turn loose. We regret that we are to lose our star station, 4BF, temporarily. His outfit is now located at 4JZ. No. 3: 4BH, $\frac{1}{2}$ k.w. spark and 10 watts C.W. is the only active station here, but he is having difficulty in reaching out. Several C.W. stations are under construction. No. 4: 4DL is heard consistently and has handled a number of messages, while 4BC continues to do good work on spark. 4OI, of Porto Rico, is heard nightly working real DX and handling traffic with the states.

HAWAIIAN DIVISION

C. J. Dow, Mgr.

6ZAC worked 16 stations, fifteen of which are mainland stations, and over 2300 miles DX.

6TQ in Honolulu has a 20 watt C.W. going strong, and we are good QSO there now. 6ASR also has a C.W. and is QSA at 6ZAC, although QRM from trolley lines prevents his working DX until after midnight. We will have a large bunch of biz to report next month, as 6TQ just came into a commission QSA and hasn't had a chance to do anything yet. No stations have been located yet on islands other than Oahu and Maui.

MIDWEST DIVISION

G. S. Turner, Mgr.

The Midwest Division is now completely reorganized. The men are beginning to work together and results are being accomplished, as can be seen by glancing through the following reports sent in by the assistant division managers. They, and their men are to be given credit for the work they have done.

NEBRASKA: The district is now completely reorganized following the appointment of Lou Chansky, 2141 S. 35th Ave., Omaha, Nebr., as district superintendent of northern Nebraska. Relay stations are requested to mail their reports early to their respective city managers or district superintendents. Stations located within the city limits of Omaha or Lincoln should report to their city manager, and not to their district superintendent. Rural stations report direct to their superintendents. Mr. Palmer of Lincoln takes state honors with 83 msgs. 9YU reports handling fifty messages for the past month and also working 7SC in Seattle on one 5-watt tube. As the Nebraska report must reach Kansas City by not later than the 24th of each month it is necessary for all reports to be

in Omaha by not later than the 20th. 9EW, Nebraska Route Manager, reports that stations will be actively engaged in relay work in Valentine and Norfolk. This should help greatly in getting traffic across the district in daylight, as Norfolk is in consistent daylight range of Omaha and Valentine. A large number of stations in Omaha are handling a large volume of traffic.

It is absolutely necessary that we receive an accurate report of the number of messages handled by Nebraska relay stations, so kindly get in touch with your city manager or district superintendent at once. Station owners desiring appointments as official relay stations, must communicate with relay officers at once. Remember fellows, a membership in the League is required to hold any office in the League.

IOWA: Traffic has increased with the fall weather and reliable DX weather has been had for the relaying of messages. 9ARZ, 9AMI, 9DKY and 9BGH, have installed 50-watters. 9BSG and 9BIK will be going with 100-watts. 9BZI and 9BCF are also installing 50-watt sets. The following relay stations have been appointed as official relay stations for the state of Iowa; 9ARZ, 9CS, 9YA (P. A. Stover, operator in charge,) 9BSG, 9BGH, and 9AEQ. Other appointments will be announced next month and we reserve the right to cancel any of the above. 9CS will have, besides the old rock crusher, a 5-watt C.W. set. 9DMH has been doing considerable DX with a flivver coil C.W. set, covering 500 miles repeatedly. 9FK is laid up with a minus field in his sync motor and no condenser. 9DVI is on the job again—and has been reported 200 miles off the English coast. 9CES is clearing traffic in great style. 9BSG reports the traffic routes throughout the state in fine shape, and everything is ready for any and all tests. 9BSG is moving to Ames. 9ZAR is now open for traffic using 100 watts C.W. 9AOU wins honorable mention in Iowa for having handled the most messages, his hook having seen 141 come and go during October.

Right here we want to say a couple of words. A "b.c.l." with a \$500 outfit kept complaining about amateur interference and we happened to drop in on him one night. The offender proved to be an aerial mail station half a mile away. Another station in the same city had the same complaint to make. We visited him and NAJ almost knocked the phones off our ears. The two mentioned are only examples of the hundreds of complaints we hear of each month. You men who want to save amateur radio, visit these stations who complain so and set them straight. It is your duty.

MISSOURI: St. Louis, Kansas City, Cape Girardeau and Springfield, all have

good clubs fully organized and affiliated with the League, or they have made application. All clubs are wide awake and active. The K.C. bunch seem to have some trouble with the broadcasting stations. St. Louis broadcasting stations are all lined up and are working in harmony with the amateurs. The assistant division manager has personally taken up certain points in dispute and all have agreed to do nothing which interferes with amateur work. We feel that within a short time St. Louis will have two nights a week reserved for amateur work—Tuesdays and Thursdays. This is in the process of making at the present time.

Traffic Manager Schnell, who was in St. Louis October 9th to 11th, spoke over the radiophone from KSD and touched pleasantly upon the amateur problem in relation to the amateur.

It has been agreed that the spark station in K.C. will not take part in the special tests that are scheduled for the near future. Practically all of the best stations in Missouri are getting lined up preparatory for these tests. All the officers are working hard and everything is going to be in readiness. Relay work in K.C. is being done chiefly by 9FM, 9AQR, 9RR, 9BKK, and 9DJB. Daily runs have been established with stations in Kansas, Nebraska, Iowa and Illinois. One route operating daily via 9YU, 9BHN and 9BKK or 9BCR. A second route is being arranged for through 9YM via 9BMN and 9SJ to K.C. Stations 9DZY, 9DCW, 9AON, 9BED, are arranging routes with Little Rock, Arkansas; stations in Iowa and Illinois for St. Louis.

9DXN and 9AAU are being consistently heard on C.W. from Gulf to Canada and to the eastern coast. 9AAU is not doing much traffic work due to the fact that he is required to spend much time in organization work for the A.R.R.L. An arrangement is being made though, so that an operator can be on regularly this winter for real DX work. Nothing has been heard of stations in the northern part of the state. Please get in touch with your district superintendent. 9AON wins honorable mention for the number of messages he handled during the month of October, not only in the state of Missouri, but in the Midwest Division. His total is 327 on C.W. Very good work OM.

KANSAS: Kansas seems to be coming into its own this month as a handler of traffic. A bunch of stations are getting on the air every night and all have reported in good shape. The result is 761 messages handled this month while for the last few months the reports have been practically nil. 9PS has been sick part of the time, but he vows to come back strong next month to make up for lost time. 9ABV blew a few tubes which has kept him from doing his full share of the work.

Around K.C. the most active stations are 9ANQ, 9CKM and 9DPL. Stations in the north handling traffic are: 9CFI, 9BHN, 9CCV, 9DEF, 9AOG, 9CKM and 9ANQ. Daylight routes have been worked on in preparation for the coming tests. A fine route is in operation north and south via 9YU in Nebraska to 9BHN to 9AOG to 9CCS to 9DUN to 5AQ. A great deal more difficulty is experienced getting a daylight test through west. However, we plan to route all messages going west to the north or to the south of us.

The following additional appointments have been made: City manager of Kansas City, Kansas; L. V. Wells, 9ANQ, 2207 Richardson Ave. Official relay stations, 9CCS, 9DUN, 9DSD, 9DPD, 9CCV, 9CFI, 9BHN, 9DEF, 9CKM, and 9AQE.

9AOG wins honorable mention for handling the largest number of messages in the state of Kansas.

NEW ENGLAND DIVISION

I. Vermilya, Mgr.

Hello, Gang! I see you are all with me insofar as this grand old game of ours is concerned. It is indeed gratifying to feel that every last one of you is squarely behind me in this division. Your messages of congratulations have helped to swell my own total for this month. I wish to extend my sincere thanks to Mr. Philip F. Robinson, who has given me such a wonderful start-off, and for his help—also Mr. Schnell, our Traffic Manager, who was good enough to call at the radio shack, 1ZE. I will do all in my power to put the first district over as the leader. I want you to know I am with you heart and soul with the old game for the love of it. Don't feel as though, "Oh, he's too busy, or he's too big to bother with me," for while I may be a six footer, I've got a great big heart for all of you. The little fellow with the little squeak box means just as much to me as the big fellow with a k.w. spark or a 1000 watt C.W. Drop me a line. Send in your reports regular, and before this winter is over, we will be the one division that is 100% A.R.R.L.

We must take our hats off to 1CNI this month and although he uses a "cement mixer," he handled 264 messages.

MAINE: 1FB reports that he will enter trans-Atlantics with 250 watts, 500 cycles I.C.W. FB. OM. Here's luck. 1FB worked 132 stations outside of first district, and has been heard at 7SC and 5XV. 1BRQ is reaching out and handled 67 messages.

VERMONT: No reports received from this section of the country, but there are hopes of receiving some good snappy ones from now on. R. P. Slayton at 1ARY has accepted the assistant division manager's place for Vermont. Here's good luck to him.

Billings is kicking over 5 TC amps on C.W. and 6.5 on spark, with more tubes and amps coming up. He is a dependable link in our organization in the eastern part of the division. 7AGF and 7HM are also reaching out on C.W.

IDAHO: No reports received. How come OM??? However, the same gang are going strong over there and shovelling traffic through 7JF, 7WG, 7AEM, 7OT, 7YA and 7LN. (Let's have a good report next month, OM—D.M.)

OREGON: Complete reports are lacking pending the appointment of a new assistant manager, however, a summary follows: Portland; 7DP, 7BB and 7JW are standing good watches on C.W. and clearing traffic with the usual speed. 7NA has left for Eugene and was last seen going down to the station with a five wattier sticking out of one pocket and a pair of cans out of the other. Nuff said.

Hooray! for Southern Oregon. 7TW, 7IW, 7TQ, and 7LR all on the job and QSR'ing everything in sight. FB. 7IW has been reported 1700 miles at sea on ½ k.w. spark, while 7TQ and 7LR are awake to the many advantages of C.W. 7HD at Seaside is consistent on his spark.

WASHINGTON: District No. 1: 7OJ, of Port Townsend, the new district superintendent, is consistent on his spark, but will soon have C.W. in. He has opened up the route to 5DX of Victoria, B. C. and considerable traffic is being forwarded. No. 2: 7KJ and 7NN continue doing consistent work. Walt. Hemrich, district superintendent, is our SUPER-DX fiend, and has handled traffic during the past month with 5DI, 9AOG, 9AON, 9PS and 6ZAC. FB. (Verily, the boy hath brains.—DM.) No. 5: 7ZK and 7BJ are on regularly and QSR'ing traffic in this district. No. 6: Traffic is being moved with fair regularity to and from Tacoma, although no exceptional distances are being worked. 7WM with 50-watts of C.W. seems to be handling the bulk of the traffic, with 7AW and 7BG on spark helping out some. 7CE is back in the relay game. Welcome, OM. No. 7: D. S. Waskey, 7UU, (the boy that radiates ohms) reports for Seattle that the prelims. have turned everything upside down, and many stations are rebuilding and testing. Traffic has been moving fairly well. 7BK and 7IM on spark, being the star stations. 7BK got the C.W. going at last, and is now handling traffic on 20-watts of C.W. The set has only been in a week, and has worked rings around the old spark from the very first. No. 10: Acting district superintendent Maybee, reports no activity but is willing to help out anyone who shows signs of activity. Come on you Yakima fellows, let's go. No. 11: This district will be the mainstay for a dependable route east this season. 7TH at Walla Walla is in easy range with 7LU and 7ZO, and they in turn, with the middle

west stations. With this arrangement it is possible to QSR to Chicago in two jumps, which will make traffic fly. 7TH will handle traffic on schedule from 9 P.M. to 11 P.M. Monday, Wednesday and Friday nights. An old timer, F. A. Moor, of Walla Walla, is putting in 100-watts of C.W. 7HR is the call. 7CE of Pasco still handles the bulk of the traffic and experiences no difficulty in working the 6th district stations. Some trouble is encountered in working Puget Sound and Portland, mainly because of few being on the air (on spark, and QSS—DM.)

ONTARIO DIVISION

A. H. K. Russell, Mgr.

At last the Ontario division to a large extent can stand on its own feet and handle traffic east and west through its own stations without routing the traffic through the northern United States. Thanks to the rapidly increasing use of C.W. among Ontario stations a constant stream of traffic is now flowing east and west, entirely through Canadian stations. The enforcement by the Department of Marine and Fisheries of the radio laws has led to the rapid abandonment, sometimes forced, of the spark transmitters.

The western Ontario district is coming too with a vengeance. 3GN, 9BS coming through fine on C.W. and 3DH who has just started up with 100 watts C.W. being QRK daylight in Toronto. 3BV is also QSA in Toronto, he being the city manager of Windsor. Byerlay promises that the western district will give the other Ontario ones an awful run for their money in traffic handling and we can well believe it. However, the central district has a big lead this month.

The central Ontario district has shown a startling increase in activity. More big C.W. stations are starting up every day. 3DS has been appointed city manager, as has 3TA. The former is QSA in Toronto and 3TA will likely follow suit. 3YH is a new man at the game, just two weeks old, and is already QSA Toronto, and is working hard on the code and will be a valuable man. 3XN was heard once in Toronto, but they are still a bit backward there. A city manager will be appointed soon, who may stir things up a bit.

The Niagara part of the district is very busy, 3KP being city manager and supervising the forwarding of traffic reports of the D.M. Toronto is simply alive with big sets. 3CO has two 250-watt Mullard tubes on the air with all the juice in the world and a beautiful aerial and is reported QSA in Los Angeles. 3GK is also a new one with 50-watts, and 3JT will be on with 15-watts. 3FO has quit his spark set, and 3GE is now on 175 meters with his 60 cycle set. He asks all who can get that low to listen for him. (Guess its the

bottles for D J though.)

The eastern district is the backward one of our trio, no stations having been logged to the east. 3LU is on the air with a couple of Mullards, but nil so far. 3HE has a new aerial up. 9BT is going now, but mostly phone broadcast. 3LL has 125 foot mast and 10-watts C.W. 2BG in Montreal has been logged in Toronto QSA and it is hoped to get in touch soon. (Too bad they can't send Scotch by radio 2BG, eh?)

PACIFIC DIVISION

J. V. Wise, Mgr.

The most important item at this time is the laying out of the trunk lines. They are: A, B, and C. Trunk A from Arizona to San Diego and up the coast to the northern end of the division. B also originates in Arizona, from there to Los Angeles, up what is known as the valley route, through Sacramento to the northern end of the division. C has its origin in San Francisco, then due east along what is known as the central route east, namely; through Sacramento, Reno, etc. Stations whose location is on or near where two trunk lines cross can serve on the two lines, this to be specified on the official relay appointment in cases that warrant such service. This may be due to the lack of good stations or to their geographical location. The list of stations to operate on these trunk lines will appear in the next report. Thereafter, stations appointed will be listed in the first report sent in after the appointment.

In this division as in all the others, every state will have an assistant division manager. The districts are to be numbered, each state having its own districts. The assistant division managers will be named in an early report.

The districts of California hereafter will be: District B—District 1; C-2; D-3; etc. Districts unmentioned below have not reported for the month of October.

CALIFORNIA: No. 1: Little news. 6AJH is now a 20-watt tube transmitter aside from the old spark. 6AHF and 6AGK are building tube sets. No reports from Riverside county. No. 2: A splendid message report of a total of 737 reported from here this month. We have no other news of interest but we know the boys are on the job. 6UP leads the sparks, while 6EA leads the C.W. No. 4: A check from five sparks shows 436 messages. The air is clear, and traffic is going to every point on the compass in good time. The sad news has leaked out that 6DP has signed a life contract with a member of the weaker sex. No wonder we haven't been able to raise him for the last few weeks. No. 8: The only stations on the job are 6TC and 6CC. 6CC is now a 100-watt tube set and is working rings around the old spark. 6TC will also be lamp equipped shortly.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Behold our "box" for this month. Honors go to a spark station, and a good one.

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*****
* 8BDA 348 Spark *
* Morriss and Stealey *
* Parkersburg, W. Va. *
*
* 3MK 284 C.W. *
* A. B. Brown *
* Norfolk, Va. *
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This month marks the addition of Porto Rico to the Roanoke Division and steps have been taken to organize this district immediately. Mr. Luis Rexach, Box 319, San Juan, P.R. has been appointed Assistant Division Manager in charge of Porto Rico. Mr. Rexach's call is 4OI and he has been clearing traffic, nightly with the U.S. through 4FT at Wilmington, N. C. All traffic for Porto Rico should be routed through this division.

There are more good stations developing in Porto Rico and a movement has been started to hook up with South America. Porto Rico now has a Radio Club of over 300 members and it is natural to presume that we will soon be hearing a number of other stations there. All Porto Rico stations please communicate with Mr. Rexach and co-operate with him as he will report your activities each month from now on.

We are glad to say that our traffic for this month has reached and passed the 2500 mark, 2514 to be exact. However the saturation point has not yet been reached since this month several of our best stations suffered breakdowns or were handicapped from other causes.

The manager wishes to impress upon the Dist. Supts. the importance of more detailed report of the activities of their territories. We can't make an interesting report out of a few cards simply stating that so much traffic was handled. Give us some real dope on improvements you have made and other items of interest to the gang. Here's the story!

VIRGINIA: For the first time all D.S. sent in their reports on time. Now that you see how easy it is, keep it up. Heretofore dead portions of this state are now opening up in great style as the following shows.

1st District. This district is by far the most active one in the state. 3MK leads the division in C.W. traffic, handling that 100-watt set like a veteran. 3ACK lost his home in a fire recently but the radio shack was saved. No report from Newport News. How? Wake up fellows and lets have something. 3ZZ has the 500-watt set going now and is smashing all previous DX records. 2nd District. The old gang is back on the key now after getting its fill of broadcasting stuff and considerable work

is being done. Interest in the Transatlantic tests is running high. 3BMN of Petersburg reports a radio club formed there, known as the Old Dominion Radio Club with plenty of pep. Three new stations opened up at Petersburg 3SG, 100-watts, 3ATB, 20-watts and 3AHE 10-watts. Both 3AUU and 3BMN are now operating with 100-watts and are getting the traffic thru. 3rd District. 3MO is working on the low antenna but seems to get out all right. 3BVL and 3AJG are getting in the game now and handling much traffic. 3BIJ is getting out all around and working all over the state in daylight. Following stations are coming up and will be heard from: 3BQX, 3AJG, 3CDZ, 3NQ, 3AHN, 3BUL. 4th District. Very little to report from this district as the the D.S. is working day and night and gets very little time for the set. 3BLF, his station, is the only one in the district and he can only operate a short time after midnight. 5th District. 3IW blew up one fifty watt and of course trfc. fell off. 3BOF is in the air now. 3SK was on for about a week but blew his tubes. 3AFW did some work with spark but failed to report. He is changing to 50-watt C.W. now and will do more work. 3CER at Ballston (Ex 4FF) has just hit the game with the Roanoke division and has 10-watts of C.W. 6th District. 3BHL is back on the air and working regularly. 7th District. 3ZAA is installing C.W. which is almost completed and will be able to handle traffic over the northern route. 3ZX blew up his condenser, repaired that, and then shot the gap motor. Install C.W. and forget it O.M. 3ASP has opened up in great shape. Traffic has been handled with 3AEV at Danville in daylight with signals very good. 8th District. Fine work has been done by 3APR. Much daylight work is done. 3BZ and 3AEV at Danville are both working as much as business will permit. 9th District. 3RF is back in the game after moving station to a new location. 3BIY has decided to lay off the broadcasting and get back into the real work. 3BHS and 3BKX two new C.W.s are getting into shape. 3HL had a rope break and put the station out of commission but is now back and going strong. 10th District. 3AOV is still working spark. Get a C.W. O.M. and do some real work.

NORTH CAROLINA: Reports from this state were very meagre in detail consequently we cannot give dope. Take a little time off fellows and expand your reports.

1st District. This was probably the most active section in point of stations operating. 4DC at Greensboro reports the formation of a club there to take care of the situation. 4GX is out of game at present. 4LJ, 4NV and 4EN are all going strong with 4LJ leading. Much daylight work is done all over N. C. and Virginia. 2nd District. 4GH, 4KC, and 4DQ are the only active stations here. All are doing

much daylight work. 4GH is at home permanently and will be an even bigger factor in the traffic report from now on. 4DQ is covering good distances in daylight now being heard in Danville regularly. 4LP is off at school for the winter and 4IE is closed up also. 3rd District. 4ID is only man handling traffic here. 4XD was on for 5 minutes one night during the preliminary tests but qualified even in that short space of time. 4EU is working some now and has been heard as far as Danville in Daylight. We are certainly glad to note signs of activity around Charlotte. Big plans are being laid for the Convention there in February at which the Roanoke Division will be heavily represented. 4th District. 4FT is the banner station this month, working nearly every night with 4OI at Porto Rico. Considering the power conditions and other factors 4FT did some great work. He has only been at the game a comparatively short time but is now ranking with the best. 4EA suffered a breakdown which put him out of commission for the major portion of the month. 4BX rolled up a total of 167 despite the fact that one operator has been sick and the other off at school. The fact that one of the Daylight Transcons starts at Wilmington is a tribute to the activity of the two stations there, 4FT and 4BX. 4NT at Wilson has been very active this month.

WEST VIRGINIA: Here again the report must suffer from lack of detailed reports. The fellows all want to know what you are doing and we can't tell them unless you tell us.

The 1st District has apparently been the most active with 8SP leading. This station also handled the 1AW-6ZAC msg. 8AFD, 8AUE and 8BPU have all been active some of them being on nearly every night keeping this section open for traffic at all times. 3rd District. 8CAY is the only active station here and he is anticipating moving out of the state. (STICK AR'ND—T.M.) 5th District. 8BKE has been doing some fine DX work having been reported several times by 6th and 7th district stations. Somehow or other you W. Va. fellows seem to be able to get big DX almost at will. What's the secret O.M.? 6th District. This is primarily the spark district with 8BDA holding the center of the stage. Early every evening he can be heard knocking them off in true commercial style. This station has been reported in all districts. 8BDA says they started out to cop the highest honors this month or bust, and they did both, or at least they lead the division and the condenser busted, so the total had to stop at 348 msgs. This is certainly F.B. and you are to be congratulated.

Dont forget that there is a valuable prize offered for greatest increase in traffic. This prize will be mailed to the winner as a Xmas present.

ROCKY MOUNTAIN DIVISION N. R. Hood, Mgr.

I wish the members of this division and others to take particular notice of the number of messages our division has handled this month. It certainly is gratifying to see our totals grow, and yet there are a good number of excellent stations that were not in operation in time to get in on the October report, and we may by next report put our message total well over 1000. Our organization now seems to be working smoothly. Due to a change in district superintendents in Utah, district 1 for that state was not included in this report. Mr. Baker was forced to resign due to his work in the Air Mail Service. 6ZM is now district superintendent of that district and your full co-operation with him is asked.

COLORADO: The last reports from the once famous 10-watt C.W. station 9DVA indicates that by December 1st a few states will be hearing from him again. Radio activities in Denver are very good and getting better. Denver alone has about ten powerful C.W. sets and handles about ninety percent of the traffic for the state. Denver was given the honor of a visit from the radio inspector and instead of the usual havoc that follows, Denver now has a number of real first class licensed operators. The broadcasting stations of Denver were also examined and tested by the inspector. Radio station 9XAQ of the University of Colorado has re-opened and is handling traffic with a small C.W. set until the 100-watter can be put into operation. The one time famous pre-war 9ZF of the Manual High School of Denver is going to re-open and discard the old time spark set for the more up-to-date type of transmission, C.W. For all the good stations in Denver, old 9AMB, 9ZAF and 9DTM, still hold the traffic records for Colorado.

WYOMING: 7AFW, 7DH, 7JQ, 7LU, 7ZV, 7OS and 7ZO all passed their first class license examination on the visit of the 7th district radio inspector. Message traffic holds up and gets better as time goes on. 7ZV is now on with 100-watts of C.W. with a sink rectifier. A daylight schedule is maintained throughout Wyoming.

UTAH: No report from district 1, due to change of superintendents as mentioned above. The A.D.M. was in Salt Lake and found many of our good men. 6AWH is monkeying with four steps AF amplification. Ouch! 6AFD is making working models of aeroplanes in the Air Mail Service, and wishing that he could get time for some DX on his amateur set. 6ZM is back on for A.R.R.L. traffic with 750-watts with 15 healthy amps. in his aerial. 6AEZ blew his tubes and then with his spark set blew all the light sockets and meters in the neighborhood so will be "down" for a while. Another reported to the A.D.M. while in

Salt Lake that due to the time he spends with his radio his "steady" has quit him. Radio is the ruination of many a good man. (Check!)

No. 2. Traffic did not come through as it was expected, but all official stations reported. (Hooray! D.M.) 6ATQ continues to do good work with his 5-watt set, working east with the same degree of ease that he works west, the eastern work being the hardest out here. The Snow College C.W. has taken form and probably will get in on the November report. Poor locations are holding 6ATQ and 6APL back. Both contemplate a change which will probably boost their traffic. 6BKE has the C.W. bug to the extent of 5-watts and as a side line is fathering a radio club in Richfield, from which, before the winter is out, we hope to have several good relayers.

WEST GULF DIVISION Frank M. Corlett, Mgr.

Despite the fact that reports from District Superintendents of Districts 1, 2, 3, and 4 of North Texas and District 4 of South Texas have not been received, this Division handled some messages according to the reports that were received from the live district superintendents. Now just why an OFFICIAL RELAY STATION would fail to report to his District Superintendent when all he has to do is fill out a blank post card that is provided for that purpose, stamped 'n everything, is beyond me. Those kind of official relay stations are not going to remain official relay stations in this division for they are sure to have their appointments cancelled. The District Superintendents also have a blank form to report on each month and there is no excuse for any of them failing to report to the Asst. Division Manager of their section.

We want reports each month from ALL A.R.R.L. MEMBERS who have a transmitting station and handle relay message traffic, not just reports from those stations that have been selected as Official Relay Stations. An OFFICIAL RELAY STATION is one which handles relay traffic consistently each month and REPORTS regularly each month and unless he fulfills those requirements he is not entitled to an OFFICIAL RELAY STATION appointment. Unless all member stations report their activities the division traffic officers will not know in every case that your station is regularly moving relay traffic and is entitled to an OFFICIAL RELAY STATION appointment. So snap into it fellows and let's hear from you each month. Our relay months are from the 15th to 15th. Mail your cards to your City Manager where you live in a city having a City Manager, to your District Superintendent in other cases and do it not later than the 16th so that he will have it by the 18th.

District Superintendents get your reports to your Asst. Division Manager not later than the 20th. Asst. Division Managers must make their reports to your Division Manager not later than the 25th so that the entire division report can be in Hartford on the 1st of the month. Now that's simple enough, lets show some team work, its not so much the individual effort nor is it our numerical strength that really counts but it is EVERLASTING TEAM WORK.

The STAR STATION for this Division this month is 5ZA with a total of 226 messages handled.

The North Texas Section leads the Sections in number of messages handled with 488 to their credit, and, get this, District No. 5, Fort Worth and Tarrant County, Dallas and Dallas County are the only ones heard from, what would North Texas Section have done if Districts 1, 2, 3, and 4 had also made reports?????. To station 5SF, Houston, Hendrix, Ft. Worth, Texas, goes the North Texas pennant for number of messages relayed 165, with 5DI. T. B. Depew, also of Ft. Worth, second, with 120 to his credit, and 5IX, Hans and Fritz Citch, Dallas, third with 101. In South Texas Section 5XAD, W. E. Gray, Orange, Texas carries off the honors with a total of 60 messages, 5XV, L. W. Hatry, Port Arthur, Texas, comes second with 37, and 5ZAE, Leavell D. Wall, District Superintendent District No. 3, third with 18. Spasmodically, it is first encouraging, and then discouraging conditions we have to report from this section. There are *many* good stations in operation and interest seems to be genuine throughout all four districts, but it is indeed puzzling to try to make a comprehensive and accurate report of the activities in these parts because contradicting statements are certain to enter into such a report under existing unstable conditions. Traffic is moving, but it is next to impossible to get the stations working to turn in reports for publication. There is no great friction between broadcast stations and amateur stations in our section other than the dissatisfaction which is caused by the long programs broadcast. No good DX traffic work can be done until after 10:30 P.M. and this condition has consequently eliminated some of our most able operators who attend school and can't keep late hours. The only stations in Southern Texas Section making reports this month are: 5XV, 5XY, 5RR, 5VO, 5HC, 5ZAE, 5AEW, 5YK, and 5ZK. For the sake of comparison we give the following, a list of the active stations who are doing much traffic work but who fail to turn in reports: 5ZU, 5AE, 5NK, 5XB, 5JM, 5BA, 5XAD, 5NN, 5MT, 5ADI, 5ACF, 5TM, 5IM, 5ACR, and 5ZP.

NORTHERN TEXAS: 5ZH reports traffic from the south can be handled to north, northeast, northwest and the west

to Pacific Coast. Traffic from north, north-east and northwest can be handled for all Texas and vice-versa. 5ZH put two "bottles" to working September 19th and since that time communication has been carried on with 45 other stations. Present known range approximately 1300 miles. There seems to be a great deal of "listening to broadcast programs." There have been some excellent programs broadcast from the different places but the A.R.R.L. messages for tests and regular traffic will have to be put through too. Come on you fellows in this district that can handle traffic and line up some routes and put over some business. Mail a description of your sets and your transmitting and receiving range, to J. L. Martin, 605 East Fourth St., Amarillo, Texas. Mr. Key of Lamesa, Texas, reports that the radio fans there, although confined mostly to receiving, are making some splendid records. Come on you bugs and get lined up. Mr. Johnson at Memphis has under construction a combination 20-watt phone and C.W. with which he will get in on A.R.R.L. traffic when he brushes up some more on the code. (Them's the fellers we need.) Also a C.W. set under construction at Childress, Texas. 5VA is City Manager for Dallas and County, all operators in this territory make reports to him. Traffic has picked up considerably in this section and has been going through regularly to the ninth district north and to 9AMB who is in regular communication with the West Coast. All the messages east have to go through the ninth district or through Houston or New Orleans as there has not been a route opened up to the fourth district. 5IX blossoms forth this month with a twenty watt C.W. using straight A.C. on the plates. He has been doing very consistent work. 5QU comes back this month with his spark, but he is installing C.W. 5BN is another new station in Dallas. He has a fine twenty watt C.W. 5ZC has been too busy with A.R.R.L. correspondence to operate his station very much this month but says he will be on more from now on. 5VA is still going strong and has received a report from Canadian 5CN in Vancouver, B. C.

5QI has been heard in every district. 5SF is stepping out too. 5DI is handling traffic direct to California stations and has made a record of 2000 miles with his 20 watter. Thats the dope, fellows, keep up the good work.

VANCOUVER DIVISION

J. T. North, Jr., Mgr.

W. D. Wood, the former manager of this division has gone away to college, but has allowed his station, 9BD, to be operated during his absence.

The following new appointments have been made: S. V. Crompton, 5CZ, assistant division manager; A. J. Ober, 4DQ, district

superintendent of Alberta district; C. O. West, 5CN, Vancouver city manager.

5CN has been doing excellent work on spark, and has worked 4DQ of Vulcan, Alberta, and several southern California stations. His spark has been temporarily closed down by VAB, the Government station of this city, so he intends to depend entirely on his 50-watts of C.W. which is almost completed. 9BD, 5CN, 5DO and 5BQ are the only Vancouver stations open for traffic at present, although several are fitting out for the winter. 5AK has put up a new aerial and is raving to go, but has been held up by delay in orders and lack of time. 10AC, the BCRA's broadcasting station was heard in Prince Rupert by 5CX. 10AC uses 5-watts. That "ten" call is another of our national jokes, straight from Ottawa. 5AX, district superintendent of Prince Rupert district has taken out a special license 9BP. He has put up a fine 90-ft. mast and is installing 100-watts A.C. C.W., so will be open for traffic very shortly. 5CT, district superintendent of Duncan district, reports two stations in Victoria, 5DX and 9BG. 5DX is reaching out in fine style on $\frac{1}{2}$ k.w. and has worked several sixes. 9BG is unfortunately short of time. 5CT and 5DQ work each other on 5-watts A.C. C.W. 4DQ, district superintendent of Alberta district, reports 9AC the only active station at present. 9AC has been heard in Vancouver on fone, so will be an important factor in trans-Canada routes. 4DQ handles most of his traffic with 7AGF, whom he works most consistently.

WINNIPEG DIVISION

J. A. Gjelhaug, Mgr.

Mr. J. E. Maynard, assistant division manager for Saskatchewan, reports that things are beginning to move in the district now. Our new district superintendent, Paul Socolofsky, 4BV, at Loreburn has made a very good start this month and is doing very good work with his 15-watt C.W., working over 1000 miles regularly. At Moose Jaw we have now a very good relay station, 4HH. There are also many small C.W.'s springing up in that city. Among them is P. Bayley of 4EC trying to find ways and means to get a 10-watt C.W. in the air. 4AL has moved to Regina where he will help amateur radio along between intermissions for CKCK. 4DN also of Moose Jaw is going to be shooting the ether with more C.W. sigs soon. He will have 5-watts self-rectified. Brass pounders in Moose Jaw seem to be numerous. They are even said to outnumber the broadcast listeners. 4CB is still waiting for parts for his transmitter but has hopes of being in the air soon. He says "if Ontario can be reached within amateur restrictions, 4CB is going to do it."

Vincent Thomas, assistant division manager for Manitoba, reports that amateurs in Winnipeg are getting more active. All stations are getting back on the air now, and three C.W. stations are under construction and should be going by winter. Manitoba Radio Association is well under way, and we expect big things doing soon. Real live bunch in this outfit—both REAL HAMS and broadcasters. CJCG and CJNC (newspaper stns.) are helping the Association through the medium of their stations and newspapers. Operators from both stations are on the Board of Directors. Ex. radio inspector is president. 4AS is now an A.R.R.L. member and is going right after the traffic.

Traffic to and from Winnipeg can be routed through 9YAF, 9ZC, 9AGN, 9GK or 9DOC. Hello! you fellows in western Ontario district, we are getting ready for that "ALL CANADIAN RELAY ROUTE." Stations are needed in Kenora, Ft. Frances, Ft. William, or Port Arthur; a good station in any of these places would help greatly to bridge the big jump from Winnipeg to the east. Let's hear from some of you fellows out that way.

Finishing and Graining a Radio Panel By Fred M. Myers

IT has been my experience with all radio panels of the variety now used, that they are either too glossy or full of small holes that make them unsightly for use on a good set.

The way I get rid of this is to grain the panel and apply an oil finish to it. The following is in my estimation the best way to do this.

The materials to be used are a piece of very fine sandpaper, a piece of fine steel wool (No. 0), some rubbing oil, and some rotten stone.

To begin, take the sandpaper and start to cutting on one end, being sure to work the long way of the panel. Cut just deep enough to go through the glossy finish and no more. As soon as the whole panel has been covered, brush off the dust and using the piece of steel wool remove all the small holes and blemishes, altho being careful not to round the edges of the panel.

Now dust off the panel and cover the surface with a thin film of the oil, rubbing it in thoroughly with a piece of soft rag. Using the same rag for rubbing, dust the panel with the rotten stone and RUB. You need lots of elbow grease at this stage of the operation. Clean off the panel with a rag and the panel will look 100% better than before.



Porto Rican News

Porto Rico of course is national and properly does not belong in this international department, but it is a long ways from the United States and until we grow to the point where we have a West Indian Division we have no better place for the interesting news coming from that little island as its amateurs grind out radio history.



We take pleasure in presenting a photograph of the Board of Directors of the Porto Rico Radio Club, which is mutually affiliated with the A.R.R.L. and which club is the center of amateur activities in the island. In this photograph are, standing, left to right, Sr. Jose M. Maduro, 4KS, secretary-treasurer and director; Sr. Luis Rexach, 4OI, director; Sr. Enrique Camunas, 4LG, director; sitting, left to right, Sr. Jesus T. Pinero, 4KT, vice-president and director; Master Luis Rexach, jr., mascot; and, last but not least, Sr. Joaquin Agutty, founder, president, and director.

4OI continues to knock 'em dead and his signals have now been reported by 6BCA, Mr. Gerard Wilson, at San Jose, Calif., which surely makes him eligible for the Transatlantic Finals. 6BCA used detector only, on an aerial 20 ft. high—and his distance is about 4000 miles! In reception Mr. Rexach is doing excellent work too, and has copied the phone signals of 4FT in Wilmington, N. C., while the latter was using 15 watts. The modest goal of 4OI is 6ZAC—and he'll get there, too!

Hawaii QSO Again

Communication between 6ZAC and 6ZAF was resumed in the first week in October and A.R.R.L. relay traffic is again moving across that portion of the Pacific in volume. One of the first messages was an announcement to Traffic Manager Schnell on the resumption of QSO. 6ZAC burnt out a bottle and was off the air for a few days but now OK again.

An Amateur in San Salvador

QST has a long and interesting letter from a gentleman in Santa Ana, El Salvador, C. A., who signs himself simply "Sparks." He describes his interesting long-wave reception, some short-wave transmission tests he has made, and states that he has developed a particularly efficient honeycomb circuit for short-wave receiving, of which latter, by the way, we would be glad to hear more from him.

If these lines reach his eye, we would be glad to have him listen in on the Transatlantic Tests, the schedule for which is given elsewhere in this issue, and let us know what he hears.

American Amateur Terms

Our foreign correspondents are vastly puzzled over many of the expressions used by American amateurs, terms which we take for granted and the perplexity over which we have never stopped to consider. For their information we will explain a few of the most commonly used ones:

73—This is a signal taken bodily into radio from American land Morse practice, and means "best regards."

DX—"Distance," more exactly, long dis-

tance. The result of an old-time habit of abbreviating well-known words by using the initial letter and "x," as, for example, "weather" is commonly abbreviated "wx."

OM—"Old man," the common amateur term of fellowship. Used indiscriminately, doubtless too much if anything. Regardless of how disrespectful it sounds and purely because its logical, the feminine is "OW."

FB—"Fine business!" meaning "that's fine news, that's great," etc.

ND—"Nothing Doing," commonly used in testing, to mean that communication is too poor to make further attempt justified.

"On the air"—Listening in.

"Pounding brass"—Transmitting, manipulating the key.

CUL—See you later.

Are there any other terms that bother our correspondents?

Letters from France

This month we are fortunate enough to have two letters from France and we gladly present them both.

Dear Brother Amateurs:

I have been asked repeatedly and very flatteringly by the Headquarters of the A.R.R.L. to write for *QST* a periodical report of what we French amateurs are doing. I will very gladly do my best to pick up for you the facts which may be of special interest to my far distant readers.

By far the most important thing at the present time is the preparation of the Transatlantic Tests. Half a dozen of us, representing the most important French amateur associations and magazines, met in Paris two weeks ago and formed ourselves into a "Comite Francais des Essais Transatlantiques" of which Dr. Pierre Corret, ex-editor of "TSF Moderne" was unanimously elected President. This committee is taking all necessary steps towards the realization of the tests and is also getting in touch with the British, Dutch, and other foreign amateur associations.

As for the actual prospect of success of the Tests, we will all do our utmost, but we must not be too optimistic and we must remember that this short-wave work is new to most of us and that it holds surprises, pleasant or otherwise, in store for us!

There are only a few really good short-wave receiving stations scattered over France. Those in the northern part seem to have a fair chance of success although already handicapped by their position compared with our British friends; but here, away down south, I am afraid OM QRN will again play us a bad trick!

As for transmitters, we will probably have half a dozen sets of 100 watts or

less, all C.W. on waves around 200. Personally I have been fortunate enough to obtain a license for a full K.W. tube set with AC on the plates, and at the time of writing these lines I am about to start replacing the old 500-watt set at 8AB by an entirely new set, including aerial, ground system and all! Be sure, OMs, that I will spare no effort to reach you as it would be one of the greatest joys in my life!

Best 73's to all American amateurs.

Leon Deloy, French 8AB.

Nice, Oct. 17 1922.

Versailles, Oct. 28.

Dear Friends:

As I told you, there is going on now at the Champ-de-Mars (near the Eiffel Tower), the first French radio exposition. It will end in a few days and has had a very great success. It has brought together 110 exhibitors and will probably have had at its close nearly 200,000 visitors. A particularly interesting point is that it numbers on its jury a number of radio amateurs: Mr. Deloy, who was unfortunately not able to come, Mr. Rousset, general-secretary for the French Society for the Study of Radio, and myself. I will send you soon more complete information on this subject, as well as photographs which I had made specially for my friend *QST* and which I will probably send as well to the "Wireless World" to show our British comrades that we also are starting "to get into the game."

I have already written you about the new law which is projected relative to radio, which the postal telegraph administration had submitted to the scrutiny of apparatus builders and of the French amateur societies. This project raised such a storm of criticism that the administration abandoned it and has replaced it by a projected decree which is very different, which was in its turn submitted to the constructors of apparatus under the amateur societies.

According to this new project, it is necessary for reception to make a declaration to the postal telegraph administration (it is no longer necessary to request an "authorization"); it is necessary to pay an annual tax of 10 francs, radiation must be reduced to a minimum in order not to interfere with neighboring stations.

As regards transmission, mention is made for the first time of "amateur stations." Up until now, we have never been anything but a question of stations for tests and experiments (for the builders of apparatus), and I felt that I was forced in "TSF Moderne," to bring up the question of amateurs. Now they are talking officially of "amateur stations." It is nec-

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Who's Who in AMATEUR WIRELESS



LEON DELOY

In this, our overseas number, we take great pleasure in presenting a foreign amateur about whom we have heard a great deal—Monsieur Léon Deloy. We have told of his doings in our *International Amateur Radio* department and of his station, French 8AB, and we know he will figure prominently in the coming Transatlantics.

Born of French parents in Paris, February 4, 1894, 8AB, because of close acquaintance with his godfather, M. Camille Flammarion, the well known French astronomer and scientist, soon developed a scientific turn of mind. As far back as he can remember, Deloy was playing with accumulators, toy motors, and telegraph apparatus. In his own words he says, "I remember distinctly learning the difference between 110 volts and 4 volts by connecting my little four-volt motor to the house mains!" This indeed was a promising start.

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W. R. BURNE

One of our most prominent English amateurs is Mr. W. R. Burne, 2KW, about which we have heard considerable. Our readers will remember him from our May issue as being the chap who walked away with first honors in receiving by far the greatest number of U. S. amateur stations during the Transatlantic Tests of last year.

Mr. Burne was born May 4, 1901, at Gatley, Cheshire, England, educated at Sale Grammar School, Manchester High School of Commerce, and took a short course at Victoria University. Being too young for military service during the war he joined the Officers' Training Corps. While at school he was deeply interested in radio and as soon as amateur restrictions were removed he again became the possessor of a receiving permit. Later permission was received from the P. M. G. to transmit. Never having had the advantage of any

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Des Moines Radio Association

On October 6th the Des Moines Radio Association opened the A.R.R.L. Midwest Convention with an address of welcome by D. L. Shillinglaw in the absence of Governor Kendall. W. H. Fowler made a peppy response and immediately thereafter the following operators were introduced to the gang: 9AIZ, 9BYW, 9AAE, 9ERA, 9DZE, 9BGF, 9ASG, 9CTA, 9XAE, 9CHO, 9BXL, 9BIF, 9IY, and Professor Deal of 9DWI. This was followed by a paper on "Storage Batteries," by Mr. McCory, and another on a "New Type of Condenser," by Mr. Callbeck. Professor Deal described WOI. The second day Professor Blum read a paper on "Manufacture of Tubes," and descriptions of stations 9BIK, 9ARZ and 9AAE were given. At one o'clock the gang got together again and discussed A.R.R.L. traffic, with an explanation of the new report forms by the T.M. Following this Professor C. M. Jansky of the U. of M. spoke on the "Amateur Status and Legislation" and later described the C.W. set at the U. of M. The affair closed with a banquet at which were present about fifty hams from all over the state of Iowa.

St. Louis Radio Association

From October 6th to 11th the St. Louis Radio Association promoted a Radio Show which turned a few dollars into the coffers of the treasury. On the night of the 10th a banquet was held for the benefit of the amateurs who attended the show. About fifty were present at the banquet when the proposed plan of the A.R.R.L. to have quiet air from 7 P.M. until 10:30 P.M. was discussed. It was a general get-together for the interest of all A.R.R.L. men to renew the spirit of amateur radio in the Midwest Division.

Radio Council of Southern New England

New officers for the R. C. S. N. E. were elected on Oct. 11th as follows: Robert B. Easton, president; R. W. Farnum, vice-president; Harold E. Peck, secretary; E. M. Woodruff, treasurer.

West Philadelphia Radio Association

At a recent meeting of the W. P. R. A. the following operating regulations were adopted by this Association:

1. All spark coils must remain silent

after 10 P.M. unless given special permission by the Operating Committee.

2. Under no conditions shall a message remain at any station longer than a period of 24 hours.

3. There shall be no wilful interference with any other station.

4. Buzzer or chopper shall not be used after 10 P.M.

5. Transmission shall stop at any station when told to by Operating Committee.

6. Before testing, listen for a period of three minutes and do not test for a period longer than five minutes after 8 P.M.

7. All local work shall stop after 10 P.M. except for transmission or reception of messages (traffic).

8. All penalties imposed on any station by Operating Committee must be strictly adhered to.

9. All violations of these regulations by any station should be reported to the Operating Committee.

10. Penalties for violation of these regulations shall be made by the Association.

Y. M. C. A. Radio Club of Sioux Falls

The Y.M.C.A. Radio Club of Sioux Falls has started the ball rolling for the Second Radio Convention to be held in Sioux Falls on December 28th and 29th. A general committee consisting of Scott Wilson, "Pete" Christopherson, Harry Manning and Welton Rowley, has been selected to make all arrangements for the affair. The convention held last year on the same dates was pronounced a great success by all those attending, and it is the aim of the committee to provide even a better program this year. A registration fee of \$1.00 will be charged.

The club is now holding its meetings in the new "Y" building and it is believed that permission will be granted to hold the convention in that building. This will add a great deal to the success of the convention because the building is up-to-date in all respects.

At the regular meeting of the "Y" club, held on October 11th, new officers were elected for the coming year, and arrangements were made to start publishing the club paper, *The South Dakota Oscillator* in printed form. The paper will be issued every other week on Wednesday. Meetings

will be held every Wednesday evening and instructions will be given in code and in theory. New officers elected are as follows: Carl Jacobson, president; George Green, treasurer; Charles Christopherson, secretary; Harry B. Manning, editor of the *Oscillator*, and George Green, business manager of the *Oscillator*.

[The *South Dakota Oscillator* has been received at League Headquarters and we recommend it to any amateur in the Dakota Division, if he wants to keep up with radio, in that part of the country—T.M.]

Radio Club of Greater Kansas City

The R. C. G. K. C. has secured new Headquarters in the Sweeney Building, Union Station Plaza, Kansas City, Mo. The following officers were elected for the ensuing year: Robert R. Moore, president; George Shirling, vice-president; Bernadotte Anderson, secretary; Dr. J. L. McDonald, corresponding secretary.

Northern Wayne Radio Club

The meetings of the Northern Wayne Radio Club were resumed September 19th with an election of officers as follows: G. B. Morse, president; L. L. Fuller, vice-president; M. J. Vinkey, secretary-treasurer.

The club is in a membership drive to double its number and is making every effort to help the broadcast listener by adopting the A.R.R.L. policy of quiet air from 7 P.M. until 10:30 P.M.

Columbus Radio Club

The C. R. C. and the Mayor's Committee on radio adopted the following rules which were agreed to by all delegates:

All spark, continuous wave and amateur radiophone sets (regular and special licensed amateurs included) which are located in the city of Columbus, Ohio, or whose owners are members of the Columbus Radio Club, shall not transmit between the hours of 7 and 10 P.M. nightly, except Saturday. These hours shall be known as "quiet hours."

All broadcasting stations located in the city of Columbus or whose owners are members of the Columbus Radio Club, may transmit any night during the quiet hours, except as follows: There shall be no local broadcasting between the hours of 9 P.M. and 10 P.M. nightly during the quiet hours.

All testing of the transmitting sets of all local amateurs and broadcasting stations shall be done between the hours of 6 A.M. and 5 P.M. The time used shall be Columbus time. These rules cannot be changed without the consent of all participants of this agreement.

Radio Club of Hartford

On October 20th the R. C. H. opened its winter season with its first meeting at the Hotel Bond. Plans for local control

were discussed and it was agreed that a committee consisting of three men at least, be appointed as a "Vigilance Committee" whose duty it is to investigate all reports of interference from broadcast listeners before 10:30 P.M. The interference in Hartford is so infrequent that it was not thought advisable to adopt a hard and fast rule of an absolutely quiet air during the evening, but that stations may transmit whenever they desired provided no interference is reported by broadcast listeners.

"Michigan Radioist"

The *Michigan Radioist*, which is published under the auspices of the affiliated clubs of Michigan, is about the liveliest sectional organ we have seen. It is just brimming over with enthusiasm for the radio amateur and the A.R.R.L.

LEON DELOY

(Continued from page 61)

The first radio set Deloy ever saw was on a steamer in 1909. The following year he installed his own receiver with electrolytic detector and learned the code, copying the press sent every night from Eiffel Tower at slow speed, until in 1912 he passed the first class commercial examination, and in 1913 he passed his bachelorship. (Degree of B.S.; that is, he's still single. Y.L.'s take notice.) The real ham fun began when the transmitter was installed on his father's yacht in 1914. Later in the year Deloy joined the French Army and went to the radio training camp. In March, 1915, he was detailed to the Eiffel Tower station where he had the pleasure of being the first to call an American station (WSL). At "FL" this French amateur was the first in France to copy signals from NPL, KET, and the U. S. Navy arc at San Francisco.

Mr. Deloy first came to our attention shortly after September 1917 when he was detailed to this country by General Ferrie and was attached to our Navy Department in the office of Capt. D. W. Todd and later Admiral Bullard, Directors of Naval Communications, until August, 1919. During this visit he formed many close friendships with some of our boys prominent in amateur affairs and many stations were visited on both coasts and the Gulf.

Returning to civilian life, he at once installed a modern receiver at his home in Nice and did his best during the Trans-Atlantics in December of last year to hear some of the U. S. Amateurs. However, he only heard one station sending "TEST" and terrible static prevented his reading the call letters. Deloy took out the first amateur transmitting license in France and with his 500 watt C.W. established two-way com-

(Concluded on page 66)



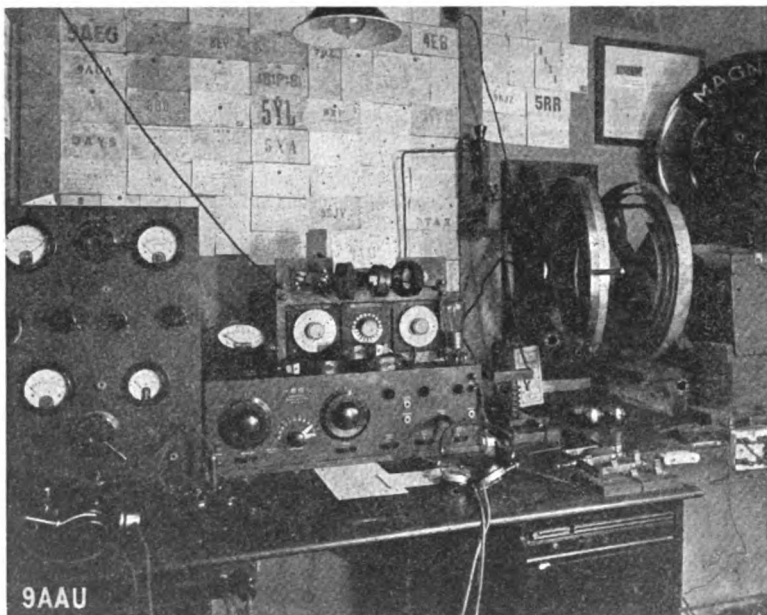
Amateur Radio Stations



9AAU, St. Louis, Mo.

9AAU is the station of Dr. Chas. L. Klenk, president of the St. Louis Radio Assn., located at 3148 Halliday Ave., St. Louis, Mo. Most of the apparatus and the arrangement of the station is shown in the photo, to which we need supplement but little.

The C.W. set shown to the left of the photo twitters along on four 5-watt tubes, pulling the juice from a 600-volt generator. As may be seen, the panel contains the full complement of rheostats and meters, as well as dials for wave-length adjust-



The aerial is of the T type, with the flat-top portion 55 ft. long and 60 ft. high, and is composed of eight wires with a down lead in the form of a cage. The ground consists of four 2-inch pipes eight feet in the ground.

This station is decorated with a good spark set consisting of a one-kilowatt Acme transformer, J-Ray gap, Dubilier condenser, and a husky oscillation transformer made of two-inch ribbon. Although this set is not to be sneezed at, Doc Klenk forgot to mention any records made with the spark, so we will turn next to the C. W. outfit.

Various keys or microphones may be connected in by means of the plug and jack arrangement and the set as a whole presents a very pleasing appearance. On voice, 9AAU has been heard in Houghton, Mich., Denver, Colo., and Orlando, Fla. The C.W. has been quite generally heard all over, San Francisco and Ketchikan, Alaska, being among the best records.

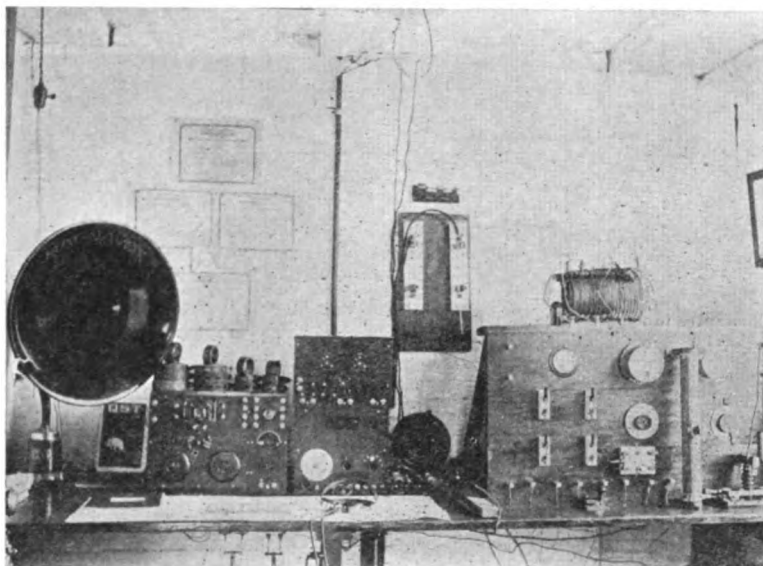
Practically everything in this station except the Grebe CR-9 is home-made. A glance at the wall proves that the apparatus at 9AAU works.

1XZ, Worcester, Mass.

1XZ is the station of Clark University, at Worcester, Mass. Although last season 1XZ was hampered by a poor aerial, traffic was handled into the 9th district by the operating staff. As might be expected, no trouble is experienced in keeping operators for the station; the biggest trouble is keeping them away, especially during school examination week.

120 cycle synk set, all of which have been junked and replaced by three 50-watters, much to the regret of the local postmaster. The filaments are heated by a large storage battery and the plates are kept from freezing by a 1000-volt, 500-watt D.C. generator driven by a $\frac{3}{4}$ -h.p. motor. With nine volts on the filaments the tubes "perk" along merrily to the tune of 5.5 thermo-couple amperes in the aerial.

The receiving set is a Z-Nith and is used

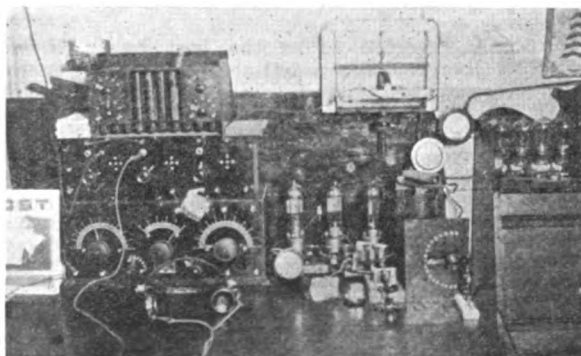


The transmitter consists of two U.V.204 tubes rated at a quarter kilowatt each, used in the reversed feed-back circuit. A very neat motor-generator set with exciter supplies 2000 volts which is fed thru a good filter the tubes. Keying is accomplished in the middle tap of the filament transformer.

The receiver is a Westinghouse, capable of tuning up to 3000 meter, and is used with two steps of audio-amplification.

The aerial that has been used was a six-wire cage, 80-ft. long and 30-ft. high. With the new sticks there is no doubt that 1XZ will be a common call in the log books of many amateurs.

with a detector and three-step mounted in the cabinet above. A "B" battery of 70-



8UE, Lancaster, N. Y.

8UE, owned and operated by N. Shaefer, at Lancaster, N. Y., is one of the C.W. stations often heard on the air.

8UE was formerly 8AGK and better known by its 25-cycle spark and later the

volts made of test tubes and Edison elements is used and proves very satisfactory.

Fine-mesh fence wire is used for the counterpoise and is made of one stretch 70-ft. long and 5-ft. wide directly under the antenna and 8-ft. above ground. The aerial is a "T" type, 70-ft. high and 78-ft. long, and consists of five wires on 16-ft. spreaders. In four weeks operation 8UE

was reported in every state east of the Mississippi river and many west. 8UE is QRV for ur msgs.

9ZL, Neenah, Wis.

9ZL, formerly 9GK, is owned and operated by Cornelius and William Quinn, of Neenah, Wisconsin, both of whom have had not a few years at commercial and amateur brass pounding.

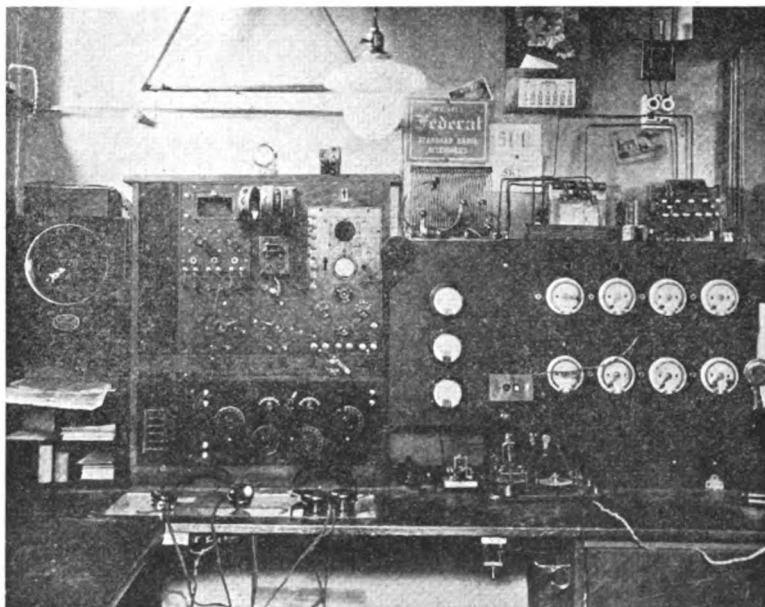
Many types of aerals were experimented with, including the cage, and the fan type

power amplifier. This may sound like excess amplification, but the Quinn brothers have their station in a restaurant and an electric piano pounding ten feet away adds to the noise, so all the receiving power obtainable is appreciated.

LEON DELOY

(Concluded from page 61)

munication with British 2FQ this spring. 8AB has since been logged by British and Dutch amateurs more than a thousand miles distant.



was finally reverted to as the best because of its excellent radiating qualities. With 2½-amperes input into the fan antenna this station was one of the first to be reported by 6ZAC in Hawaii and has since been reported on several occasions.

Four 5-watt tubes are used with the Hartley circuit and by recent "diddling" the antenna meter has been coaxed up to 3½-amperes. On the transmitter panel may be seen the filament rheostats, antenna ammeter, filament voltmeter, and plate milliammeter. The voltmeter is arranged on a plug so it can be used with each individual tube for correct filament adjustment by plugging in jacks connected to the tube filament leads. A straight key, bug, and omnigraph (?) are used.

The honeycomb set shown at the top is used for long waves and a short wave regenerative receiver is used for amateur work. This latter set is equipped with two stages of radio frequency amplification in conjunction with a three stage Magnavox

Leon Deloy was asked a year ago by General Ferrie to take charge of the amateur part of the Societe des Amis de la T.S.F. and is also associate editor of *L'Onde Electrique*, and founder and president of the Radio Club de la Cote d'Azur but we expect his greatest fame will be when he establishes communication with American amateurs this coming winter.

W. R. BURNE

(Continued from page 61)

technical instruction in wireless, its study has been pursued as an amateur and a considerable portion of the gear is home-made. Unfortunately he was not far enough ahead for the first Transatlantic Tests in February, 1921.

A month before the second test Burne had the misfortune to hurt his foot and had given up all hope of entering the test. With a desperate effort and a true ham's determination he managed to rush together

(Concluded on page 69)

Strays



The Second District Executive Radio Council has "cleaned house" and got on a purely amateur basis, completely ridding itself of commercialism. This is the best news we have had in a long time and we offer our hearty congratulations. Mr. Arthur A. Hebert, 2MP of Nutley N. J., and incidentally A.R.R.L. treasurer, is president of the Council and Capt. Droste of the Signal Corps, a splendid amateur, is the new vice-president.

The Council, it will be remembered, has run the largest and most successful radio shows ever seen in New York; indeed it was the success of their last affair that awoke the professional promoters to the possibilities of radio exhibits. Their annual affairs are the culmination of all radio for the season, and success is assured when the affairs are in the hands of practical amateurs. This season instead of the public show the Council is going to have a three-day *amateur convention*, with a radio show for *amateurs*. The roof garden and adjoining Butterfly Room at the Hotel Pennsylvania have been obtained for March 1st, 2d, and 3d. The various clubs affiliated with and making up the council will have booths, there will be some historic radio exhibits, and a manufacturer's show of apparatus of interest to amateurs. In order to keep the crowd within bounds and not have a repetition of last year's terrific crush, tickets will be sent to the different Second District clubs for distribution. The convention will be open only to licensed amateurs and their friends. There will be 24 booths open to bona-fide radio manufacturers, but dealers will not exhibit.

The Council and the A.R.R.L., with their respective magazines *The Modulator* and *QST*, will keep open house and greet you there.

The classical New York radio show for the general public this year is the American Radio Exposition, which will be held at Grand Central Palace from Dec. 21st to 30th, inclusive. We have rather favored the idea of three big annual radio shows, in Frisco, Chicago and New York. This is the New York one. The management is going about things in a high-grade manner and every indication is that the affair will be a classic. The Second District Council and the A.R.R.L. will be on hand in Booths

14-A and 14-B, with Bill Crosby and his wicked gang from *The Modulator*, and Charlie Service, Fred Schnell and Ye Ed from League headquarters. All amateurs are invited to drop around and see us; we hope to have the latest red-hot Transatlantic news on tap. Folks interested in joining the League or a local radio club will be welcome and we will be glad to do our very best for anyone interested in radio.

Signal Report Cards

Have you got a good card for reporting signals heard? Send us one, will you? We want to find out what the best arrangement is, and will publish several of the best ones for general interest. We offer five pads of A.R.R.L. message blanks to the station sending in the best card by Jan. 1st.

In erecting Beverage wires, don't forget to determine the proper direction. Radio directions are along an arc of the great circle thru the points of transmission and reception. The shortest distance from us to England and France is not along a line running east, but from the Atlantic states is almost north-east and from the Pacific states is still further to the north. Stretch a string on a globe and you'll get a surprise. Then try your hand with the formula on page 12 of July *QST*, if you can work trigonometry, and lay out your antenna, remembering also that your compass probably points quite a bit to one side or the other of the true north. If you don't know this declination, ask a surveyor or consult a high school physics textbook.

How many of you have noticed in cutting off the filament of an audio amplifier how the signals suddenly increase for a second? Can anybody explain the effect? It isn't super-regeneration; but what is it, and has anybody any idea how that immense additional amplification might be made permanently available?

A contributor in the British "Amateur Wireless" points out that in the short time necessary to burn out a tube, one is spending money at the rate of \$50,000,000,000 a year. We can all live like millionaires, fellows, but only for a twentieth of a second at a time.

Read 'em and Weep!

M. B. Lowe, well known ship operator, reports French 8AB QSA 957 miles due west of FFU, on the west coast of France, using one stage audio.

1BNL at Saco, Me., reports that with one five-watt tube and an antenna current of a quarter of one ampere, he has been heard by 7IP, 7UF, XO5, and LS4 in Liverpool, England.

9AWM, at Sleepy Eye, Minn., logged 6ZAC of Hawaii calling 9ZN, and gave 9ZN a QSQ. 6ZAC heard 9AWM and called him, after which two eastbound msgs were handled and one westbound msg without a hitch. 6ZAC used one 50-watt and 4 amps. in the aerial while 9AWM used one 250-watt but only 900-volts on the plate.

6KA, 6XAD, 7ZO, and 5KC continue to be heard all over the east coast, according to dozens of reports we have been getting.

When 2GN on Long Island, using a 5-watt tube and plate supply from a Ford coil, can be copied in Winnipeg on one tube, we say it is not so bad. 9DDY, in Cabery, Ill., with the same kind of transmitter worked 65 DX stations in 11 states during October.

8ZY has heard these: 6ZZ, 6ZG, 6ZF, 6ZM, 6ZK, 6XJ, (6XAD), 6BSA, 6EN, 6KA, 7AD, 7ZU.

6ABX gets into N. Y. on 10-watts.

8ZZ was copied by twelve California stations during October.

9ZN's new 500-cycle I.C.W. is terrific on both coasts and readable thru heavy static at 6ZAC.

6ZAC reports the following heard on ten nights: 2FF, Can. 4BV, 4BQ, 5ACF, 5NK, 5TJ, 5SF, 5PX, 5XAD, 5ZAW, 5ZH, 5ZA, 8BUM, 8WR, 9AMB, 9ANQ, 9APH, 9AWM, 9AOG, 9BEY, 9BJI, 9DSM, 9GK, 9MF, 9XAQ, 9YAJ, 9ZAF, 9ZX.

We hear that the various 1AAW's will be on again for the coming transatlantics with the same spark heard by Godley at Ardrossan last year. You receiving stations in New England, swing a wicked loop. There is only one 1AAW and he is at Georgetown, Mass., at present using 5 watts C.W.

In the Reinartz article in October QST, the grid condensers are evaluated at .0025 mfd. in the first diagram and its description, whereas they should be .00025 mfd. For those having difficulty in getting this new circuit to oscillate, we suggest a shorter aerial or a larger choke.

And after all this arguing about soldering to water pipes, 9BAV comes along with the bright suggestion that if the water is shut off and the pipe drained, the soldering is easy with a blow torch and acid core solder. After the joint is made, the acid should be washed off with strong soap and water.

Letters continue to roll in regarding the dark horse of last year's Transatlantics, "1AAW." In our September "Communications" we published one such letter; now we have another from a chap signing himself "S. E. T." who says very frankly that our September contributor didn't tell the truth and that he, S. E. T., helped another bird operate station 1AAW somewhere in New Jersey with a 3 k. w. spark. Then we have a real line on a fellow in Maine who has plenty of money and therefore lots of noise-making apparatus but too much laziness to get a station license of his own, preferring to use anybody else's call, and 1AAW might have taken his fancy that particular night. Personally we think that it might have been 9AAW, as he fitted the specifications perfectly except for the numeral. It is one of those mysteries that probably never will be solved.

Many moons ago we to'd in QST how the shack of F. M. J. Murphy at 8ML, Cleveland, had been completely cleaned of all its valuable apparatus. Cleveland dailies recently chronicled the sequel. It seems that all last winter and spring a crop of illegal two-letter stations flourished in Cleveland, one "LX" in particularly raising Cain, and making life thoroughly miserable for Cleveland amateurs with all the little tricks known to the Lizzie Lispers—except that he had a QSA like a half k.w. 8BK swung a wicked loop and got his general direction, and 8BDV chased up and down alleys listening for the crashing spark until finally the joint was located. Ensued a friendly call, whereupon 8BDV reported enough junk to operate Radio Central and corresponding in spots to the deceased from 8ML's shack. With 8UK and 8BK and two detectives, 8ML visited the radio museum and found that an 18-year old boy on a \$10-a-week salary had accumulated equipment for three ½ k.w. snarks, a C.W. transmitter in a cabinet with bakelite panels 5 ft. long, long and short-wave receivers and three step, motor generators in operating and post-mortem condition, and everything to demonstrate the stunts in Hopkin's "Experimental Science." The young prodigy was loaded into the perambulator and eventually came to trial. He had stolen goods before and now graces the Mansfield Reformatory, since which time there have been no more radio robberies in Cleveland.

9XZ rates the rubber ohm saw for signing off with "23 Old Man, Good Night."

T'was Ever Thus: "Ur CQ sigs hrd QSA vy OM."

9CS has a nifty card scheme which includes photos of his station.

Dern these amateur phones who pronounce their call letters while they gargle a sore throat. Can't tell who they are. Why not use the Navy phone code as Godley did in his reports from MUU last year: able, boy, cast, dog, easy, fox, etc.? F'rinstance, "Eight able watch pup calling two oboe mike." Get more report cards, then, too.

Mr. C. A. Lowry, of Toronto, reports that he has noted a variation in reception in accordance with variations in the magnetic flux of the earth's crust as indicated on isometric charts prepared by the Canadian Government for the benefit of mariners. The possibilities of this matter will interest some of our more scientifically-inclined members.

Fred Terman, 6AE, old A.R.R.L. member, is at M. I. T. this winter and doubtless will be heard on the air from 1XM.

Lots of so-called "French" tubes on the market now, made by various people whose names do not appear on them. Most of them are gassy and so are fair detectors when you get a good one but almost all are irregular in characteristics and operation. Be careful what you buy.

At last the shy, bashful 2TS has fallen in love. He has been seen wandering around town trying to sell spare parts of his set. In fact, just as we are going to press, we learn that he was seen offering to exchange his whole set for a couple of theatre tickets!

Many of our readers have perhaps wondered at the values of the various condensers in the Radio Corp. book entitled, "Radio Enters the Home," so here they are:

W.E. type No.	Capacity	Votlage test
21AA	.85—1.15 mfd.	1000 A.C.
21R	.1 — .135 mfd.	500 A.C.
21U	.05— .068 mfd.	1200 A.C.

Radio Wives

Nowadays it isn't "can she cook—can she sew?" These up-to-the-minute radio flappers don't go by old rules. Can she tune an Armstrong souper? Can she climb a 75-ft. mast while hubby jams the key to see if the old spark radiates as much juice as the C.W.? Or one of the lesser credentials; does she know the code? She's got to so's she can listen to her husband's conversation with that pretty regenerative blond around the corner of the next state. And least of all recommendations: can she stand all that mess of junk surrounding a Fleming vacuum right plank bang in the living room?

—6ADF

Overheard at Lunch

K.B.W.—Say Schnell, I would like to have a nice "cut-a-way" coat to match the hat I won on the Trans-Atlantic tests.

F.H.S.—All right, OM, we will have another series of Trans-Atlantic tests in December.

(K.B.W. will take on all comers to the tune of a new coat.)

6EN has been using two 50-watt tubes for over eight months with 3000-volts on the plates. The milliammeter reads up to 500 and is shunted to keep from blowing it to smithereens when the key is pressed. When transmitting, the room is lit up as if from a flashlight!

One manufacturer recommends "loafing coils" for those who hang around 360 meters.

No wonder 6AJF does such DX on 15 watts! The junk is mounted on a Ouija board!

For those who use a Magnavox in place of the cans, R. L. P. says that if the step-down transformer burns out a Ford coil can be substituted with equal results.

8ZZ has a \$25,000 ground! It is composed of a five year's supply of copper color engraving plates, 250 in all, costing originally \$100 each.

Old brass or copper tubing secured at any garage can be bent, flattened, and drilled on the flattened ends to make many useful brackets and supports.

1GV, whom we hear on the air so much, is Mr. H. H. Tilley. Cards should be addressed care of Pitts Radio Store, Woolworth Bldg., Providence, R. I.

Spark is fast going west.

W. R. BURNE

(Concluded from page 66)

a four-valve set and heard 2FP at 2:33 A.M. on the first day of the test. This is the first official record of an amateur signal from this country crossing the ocean.

Mr. Burne is a member of the Manchester Wireless Society, an Honorary Member of the Liverpool Society and Bolton Society, and Honorary Vice-President of the Blackpool Wireless Society. A special transmitting permit has been granted the Manchester Society for testing to America and a big one kilowatt tube set is being installed by a committee on which Brother Burne is taking active part. The keen interest taken in amateur radio by this live-wire enthusiast is typical of many of the English amateurs who are up on their toes for this season's tests.

The Junior Operator

(A department formerly known as "With Our Radio Phone Listeners.")

Radio Directs Construction Job

Just over the crest of the Kaiser Range in the Sierras, at an altitude of nearly 10,000 feet, the Southern California Edison Co. is operating three continuous wave (C.W.) stations for the direction of the work of 4500 construction men. This winter 500 men will go into camp behind thirty miles of impassable snowdrifts to push forward during the winter the greatest piece of tunnel construction now in progress in the western hemisphere.



The headquarters station at Cascada is at an elevation of 5,000 feet and in a canyon 2,000 feet deep with abrupt walls on three sides. The construction camps are eight miles distant with unusually poor territory between. Three transmitters of one-half kilowatt, equipped for straight C.W., buzzer modulated, or phone, are used and work very well. The antennae are about 140 feet high and during the evening periods when orders are not being transmitted, entertainments from various broadcasting stations are received and the isolated men know the news of the world as quickly as other people read it in the newspapers.

WOC

One of the latest broadcasting stations to cover great distances is WOC, the station of the Palmer School of Chiropractic at Davenport, Iowa. This station has been heard on both coasts QSA and the selections we have heard here in Hartford from WOC seem better than the average. The printed weekly program is a beautiful booklet.

Receiving Aerials

It is a quite general opinion that a single circuit tuner cannot differentiate between stations on adjacent wave-lengths as well as a properly operated three circuit tuner. For this reason we have always favored this latter type, especially in congested communities, and in October published in this department some suggestions on how to get the most out of this type of set. However, there is another factor about which we have heard little but which seems to have an effect on the sharpness of tuning, and that is the design of the receiving antenna.

The ideal receiving system should tune to *one* wave-length, and all other signals on nearby waves, even tho of intense power and next door, *should not be heard*. When listening on 360 meters to a DX (distant) station your local broadcasting station on a wave almost the same should not be heard if you have an ideal receiving system, and amateurs in the same block could work at any time without you hearing them until you were almost exactly tuned to their wave. But ideals are seldom realized and we must compromise all the way thru. We cannot construct an antenna of zero height and length nor can we conveniently wind tuners with wire larger than fire hose in an effort to accomplish an ideal, but by knowing what we are aiming at we will come nearer the mark than if we had nothing to aim at.



The big bugaboo in radio (outside of QRN, QRM, "rotten fists," and a few other things) is *resistance*. Resistance is almost invariably a *loss*; and in receiving circuits it is worse than that for not only is the

signal strength decreased but the tuning is broader and interference becomes greater. Therefore our aim is to keep the resistance as low as possible.

It appears from what we have been able to gather that a long and high aerial, such as we often see installed for broadcast reception, makes tuning to one wave-length alone a difficult if not impossible operation. Experience is pointing out that for real selective reception the aerial should be much lower and shorter than we commonly find.

The reason for this is undoubtedly because of lower resistance. The resistance of an antenna is the result of many factors and the chief offender is known as "radiation resistance." This varies for different wave-lengths (see curves on pages 18 and 19 of April QST) and is at a minimum at a point roughly 50 per-cent above the fundamental wave-length of the aerial. A high antenna has high radiation resistance which is added to the other resistances and makes broad tuning. A long antenna has such a great fundamental wave-length that it is generally more than the wave it is desired to receive so only a small number of turns for coupling is allowable and a series condenser must be inserted to reduce the wave and this condenser must be used at low values. This condenser means more resistance.

On the other hand a short aerial permits the insertion of considerable inductance in the aerial circuit to get the desired wave-length, and this has an effect known as "stiffening" the circuit, making it much more selective and better able to differentiate between nearby wave-lengths. The simple single-circuit tuners so much in vogue for broadcast reception are designed to operate on a short low aerial and it is a fact that on the size of aerial they are intended for their operation is not particularly unsatisfactory. Most of the interference troubles experienced with such sets can be charged to the use of too big an antenna, as when used with high-capacity high-impedance antennas such tuners are almost worthless in point of selectivity.

Therefore, if your aerial is only thirty feet high and eighty feet long, don't worry, as you can get better selectivity than the chap with the high aerial a block long, and what slight decrease can be noticed due to the smaller aerial is more than made up in one step of amplification and the result is comparatively free from interference.

B.P.

Where to Get Your Call Book

The "Amateur Radio Call Book," put out by the Radio Directory and Publishing Co., 45 Vesey St., N.Y.C., contains the call list of amateur, special amateur, and broadcasting stations in this country and Canada. Data on the construction of a honeycomb

set is also included as well as a good size map in two colors, marking the location of broadcasting stations and showing the change in time and the area of each amateur district. The price is one dollar, post paid.

The Citizens Radio Service Bureau, of 416 S. Dearborn St., Chicago, Ill., have been putting out a call book of loose leaf form and accepting subscriptions for supplementing pages to be added after each district monthly. The cost of this service, however, has been so much that its popularity has suffered, so the publishers now have put out a call book containing U.S. and Canadian amateur calls complete to date, and selling for 50 cents.

The first issue of "Official List of Radio Stations of Canada," put out by the Department of Marine and Fisheries, Ottawa, is exactly what its name implies. It includes the commercial as well as amateur stations and should be authentic. The department has hesitated for two or three years as permission to publish such a book was made contingent on the list paying for itself. This year it is hoped that the demand will be sufficient to make it self-supporting and the price has been set at cost, one dollar, which includes all supplements. This very attractive book is made with a loose leaf binding so the supplements can be easily added.

The new Consolidated Radio Call Book, which contains amateur, government, and commercial calls, U.S. and foreign, will not be ready for several months to come. The price is \$1.50 and they may be obtained at most radio stores.

The much looked forward to June 30, 1922 edition of "Amateur Radio Stations of the United States" is now being proof read and will probably be ready for distribution about the middle of December. Copies may be obtained by sending fifteen cents (not in stamps) to the Superintendent of Documents, Government Printing Office, Washington, D.C.

When the Whitehall Viaduct district of Atlanta, Ga., was ablaze, WSB, two blocks away, first gave out the news and kept the listeners informed of the progress of the fire fighting.

LETTERS FROM FRANCE

(Continued from page 60)

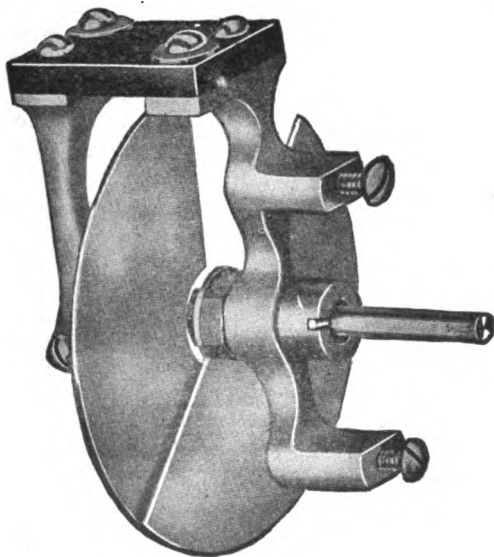
essary to request an authorization and to pay 100 francs a year. It is necessary, likewise for the first time, to have an operator's certificate delivered, after examination, to the applicant by the postal telegraph administration, the charge for which is 15 francs. Damped waves are prohibited, as well as I.C.W. Only continuous waves are authorized, actuated or mod-

(Continued on page 74)

NEW APPARATUS

This department is not conducted for the purpose of accordng free publicity to advertisers. It stands on its own bottom. Its purpose is to give QST readers accurate information on new products. Apparatus described here must be sufficiently interesting to give its description and interest to our readers. The contents of this department will be selected each month from the most interesting material at hand.

A VERY well made vernier condenser, made by the O. C. White Company, has been received at our office and presents several nice features. This condenser has a new type cone bearing with spiral spring tension which is not only self-centering but affords constant and positive contact. Thus the electrical resistance thru the bearing remains constant and all possibility of scratching noises



during adjustment is eliminated. The back vane may be adjusted for any air gap from one-fourth inch or less between plates, allowing greater or less ranges of capacity. Connected across a .001 microfarad condenser having a dial of 100 divisions, this vernier set at one-tenth of an inch spacing will have a capacity variation equal to one scale division; but it can easily be made to cover more or less than this by adjusting the air gap. The mechanical construction is at least equal to the electrical and we think many of these condensers will find a home in an amateurs' station.

The Alden-Napier Co. have brought out three new pieces of moulded apparatus that attract the eye. The moulded condensite and bakelite products are not melted by the heat of the tubes or soldering iron and are almost indestructible.

The "small space" socket, in addition to what its name implies, is free from excess metal, has readily accessible binding posts, and sells for such a ridiculously low price that a detector-two-step outfit can be fitted up for a dollar.

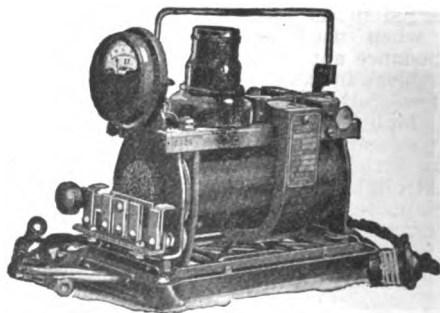
The "de luxe" socket is made of the same hard material and has a protected reinforced slot. The patent clip feature insures positive connection to the prongs of the tube as there is a wiping contact on both the bottom and sides as the tube slips into place. The illustration does not show this feature but we know it is important.



A condensite dial is also put out by this company. It is so shaped that the fingers of the operator do not hide the numerals and is a marvel for lightness and reduction of absorption losses.

The France Manufacturing Co., in addition to their well-known six volt battery charger, have brought out a B-battery charger and a combination A and B battery charger.

In the combination rectifier illustrated herewith, throwing a switch from A to B performs the necessary voltage change. The rectifier is equipped with carbon electrodes and utilizes both sides of the cycle for the heavy-current A-battery charging.



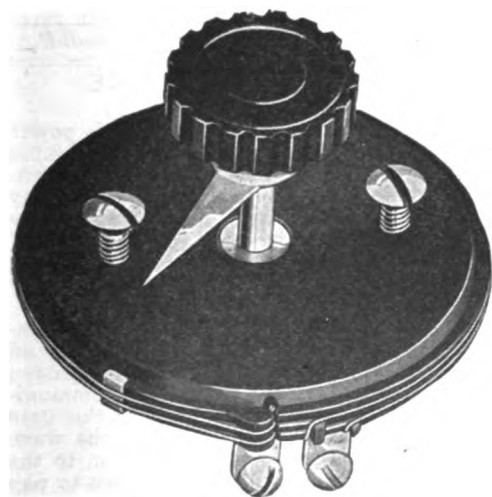
The high voltage for B-battery charging is obtained from a separate secondary winding on the transformer which not only allows voltages in excess of the line voltage to be produced but also eliminates metallic connection with the power circuit and the resulting dangers should the battery be.

accidentally left connected to a grounded circuit. Batteries up to 120-volts can be charged at a rate depending on the size of ordinary lighting bulb screwed in the socket provided on the instrument.



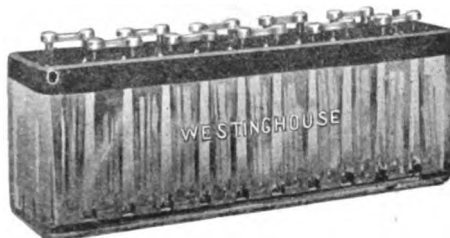
We must confess that we have been rather leary of these plugs that attach to the lighting socket and take the place of an outside antenna but a sample of the "Antenella" manufactured by Chas. Freshman Co. has been tried out with results far greater than expected. The plug is nicely made and with terminals on each side so that it may be pulled apart, turned over, and plugged in, thus connecting to the other side of the line thru one of the contained condensers without removing the plug. For those who are unable to construct an outside antenna this plug may find favor, although it is hard to predict the results for any location. An individual trial is the only way to judge.

The Springfield Wire and Tinsel Co. have brought out a braided antenna cable made of 16 flat strands of copper braided into a hollow cable of about a half inch circumference. Because of its great high-frequency conductivity it has been "all the rage" for indoor loops, although an antenna



of this cable constructed by the writer at 1HX last spring has proven very satisfactory.

In the field of storage "B" batteries, we find the Westinghouse Union Battery Co. has a marvel of compactness which is built to serve indefinitely. The eleven cells are compartments in one jar, which is built of glass so that the interior of the battery is at all times clearly visible, which is handy when inspecting, charging, and adding water.



Some Interesting New Rheostats

A rheostat seems like an easy device to make so we are not surprised to find a new one nearly every time we pass by a radio store. Out of about 57 varieties we have picked a half dozen that are deserving of some mention.

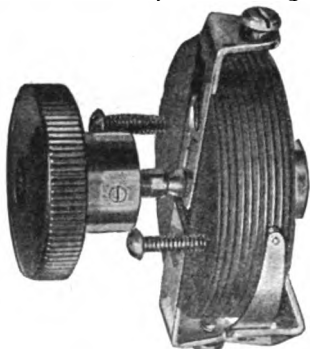
A refinement in receiving apparatus known as the "Pot-Rheo" has been brought out by the Acme Apparatus Co. and is a combination unit containing a potentiometer and rheostat mounted concentrically in the same base. The 4-ohm rheostat provides excellent filament control and the 200-ohm potentiometer may be used for fine variation in B battery potentials on a detector tube, grid potentials on amplifier tubes, or as a stabilizer, so essential for radio frequency amplification.



The Jewell Electrical Instrument Co. has put out a rheostat that carries out a new idea. It has four ohms resistance and is designed for exceptionally nice control of a single tube. The idea is to connect a master rheo in the storage battery lead and use it for coarse adjustments and the individual tube rheostats to control the individual tubes. When the storage battery voltage drops a little, only this master rheostat is adjusted to compensate for the drop. The individual rheostats need not be touched after once adjusted for the correct proportion of current to each tube, as the master takes care of the dropping voltage of a dying battery or the higher voltage that is generally found on turning on the juice the next evening. The sliding contact

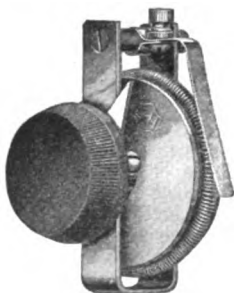
under the two parallel wires makes possible a vernier adjustment of considerable range.

The Jenkins vernier rheostat comes mighty close to our idea of the right kind of a rheostat, there being no extra levers



or movements to throw in the vernier effect which for the most part are limited in range. This rheostat is vernier every inch of the way as the resistance wire is wound around the circumference of a threaded drum as shown in the illustration. Another novel feature is fact that pushing the knob breaks the circuit, so that when filament current is again required the knob is pulled and the circuit is closed at the same resistance as was previously found best.

The Cutler-Hammer Mfg. Co., well known as rheostat manufacturers for many years, have entered the radio field and have brought out a rheostat designed along different lines. The spring contact fingers lie in the direction of travel insuring smooth, quiet, and positive regulation. Cone shaped knobs are provided for the vernier rheostat and "full off" and "full on" positions are found in both types.

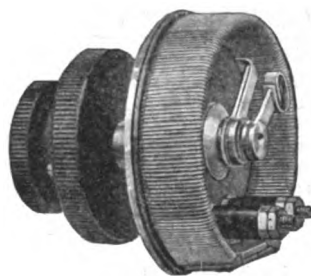
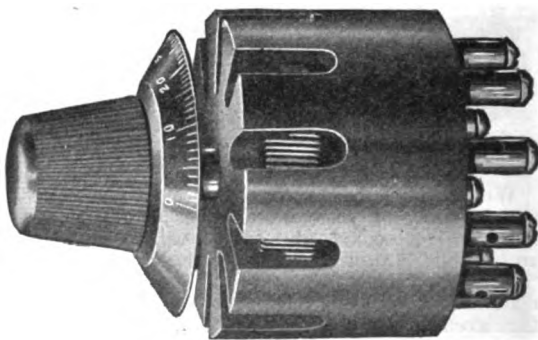


The Klosner Amplitrol is of such unique design that once again we bring before our readers product of this company. With the Amplitrol it is no longer necessary to plug from one am-



plifier to the next, as the phones or loud speaker can be attached to binding posts and the knob of the Amplitrol controls the filament current and performs the necessary switching to any stage.

Not to be outdone by the others, old re-



liable Thor-darson has placed on the market a very rugged two-knob vernier rheostat. The fool-proof spring contacts and the base of stone go to make up a rheostat that

is not to be sneezed at.

After all, the best way is to look them all over, try out a few dozen, and then purchase one, but it won't hurt anyway to know what the latest fashions are in rheostats—hence the above.

—B.P.

LETTERS FROM FRANCE

(Continued from page 71)

ulated by the voice. The maximum power is 100 watts input. Wave length must be between 180 and 200 meters. All general traffic is prohibited; the station "may only communicate in a manner necessary to the functioning of the apparatus" (QRK? QSA QSB!!!) "to the exclusion of all communication having an actually useful or personal character."

If one wishes to carry on ordinary communication, the station is no longer an amateur station but a station "intended for the establishment of private communication." The maximum power in this case is less than 400 watts input and the wave length 150-200 meters. In addition to the 100 francs tax, it will be necessary to pay from 20 to 60 francs per watt input provided that the power input varies from less than 25 watts to 400 watts. A 400 watt sta-

(Concluded on page 91)

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents.



QSL By Card

Washington, D. C.

Editor, QST:

It becomes my duty as an amateur to ask if it is possible to give a little space in our valuable magazine to request the fellows to QSL by card if they hear a distant amateur. I believe the gang has been rather lax in the matter. Believe me fellows, when I get up in the morning and find in the mail that a guy in a distant state or city has heard my sigs QSA or the like, I can eat better and work better. The same thing works when I get home at night.

The gang ought to keep up the practice. It does not cost a heap of money to have some cards printed. A plain post card costs but one cent. Let's get busy and help the other guy. He can judge by the cards he gets that his transmitter is getting out. Let's start the slogan: "QSL BY CARD."

Radioly,
Jack Hillers.

[Editor's Note: He is right. We must not let up on this, for sending a card is rendering a fellow amateur a service and it may mean a record for him. We thought at one time that anything in excess of a watt per mile was a record but now we would hate to say what constitutes DX. However, a card even to a nearby station may be joyously received as a small set may have been used at the time and a "happy combination" hit upon. We wish also that persons receiving reports of their signals would be more appreciative and promptly acknowledge.]

The Glad Hand

Chattanooga, Tenn.

Editor, QST:

I have just returned from a trip to Detroit and drove back overland. It was my desire while in the north (Detroit, Toledo, Cincinnati, Louisville, etc.) to talk over some of my problems with others who might have had some experience that would help me. To my surprise I could not find anyone that was interested. This was because I did not know who to see and where to go. All that I was able to do was to drop into a radio store and ask for information. This they would not or could not give. Either they did not

know, which was usually the case as they were mainly beginners, or they only wanted to sell something and unless you wished to buy they had no interest in you.

Now I believe there are many of the old-time hams in that part of the country, just as there are here, who would be very glad to see you if you knew where to find them. The magazine *Adventure* has formed thruout the country what they call Camp Fire Stations where the so-called "adventurers" can drop in and get information and meet others of their kind. What do you think of the A.R.R.L. doing something of this sort for the traveling ham? I have no doubt there are many of the fellows passing thru Chattanooga whom I would be glad to see, but they do not know where to go. If QST could publish a list of places where they would be welcome, they could take the page with them. If you would like to take this up I would be glad to offer my office and station as a meeting place for those visiting Chattanooga:

Daytime: 424 Hamilton Natl. Bank Bldg.,

Telephone, Main 145

Night: 624 Carlisle Place

Telephone, Main 3978

Another suggestion: while coming thru the different towns I saw many antennas. I would like to have known whose they were. There was nothing to indicate whether they were relay stations or only broadcasting listeners. Why not have the call letters put outside so all who go by can read?

Yours truly,

Benj. F. Painter, 5MB

A.R.R.L. City Manager

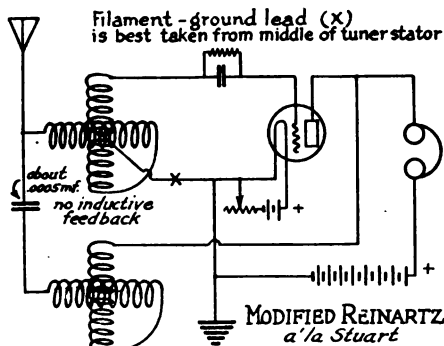
[Editor's Note: Mr. Painter's suggestions are fine, but to do the job thoroly we are afraid would take more space in QST than could be spared for the limited number of our members who travel regularly. His last paragraph proposes another scheme, however, which should solve both matters. Why not something to stand as an "A.R.R.L. Welcome Sign"? For example, a sign of standardized design reading "A.R.R.L. Station 5MB," which all of us knew meant that here was a ham's shack with the ham spirit inside where kindred souls may foregather and masticate the stocking. Further suggestions are requested from the gang.]

Another Reinartz Arrangement

Livingston, Mont.

Editor, QST:

I have something for your "Reinartz symposium"—the attached diagram will explain itself. Simply two variometers and one small fixed condenser constitute the whole thing, no switches, no variable condensers. It is so very simple that it seems foolish but I can tell you that it works surprisingly well.



The trial instrument that I am using with this circuit consists of two home-made ball-and-cup variometers, home-made fixed condenser (about .0005 mf.), a panel of wood backed with a sheet of zinc (grounded), and a base of wood. The variometers are rather larger than ordinary, 4½" rotors, and give me a range from something less than 200 to over 600. Spark, C.W. and phone seem to come in with equal strength, which is greater than I get with the spiderweb Reinartz. This results I suppose from the fact that this circuit does away with the shunt tuning condenser, accordingly to Reinartz' latest ideas. This set is handled with surprising ease and certainty.

Yours cordially,
J. E. Stuart.

F.B.!

Rocky Mountain Div. HQ.
1022 So. Ash St., Casper, Wyo.

Dear Friend Schnell:

My darn old battery went dead on me tonite while I was trying to entertain the wife with a radio concert, so we went back upstairs. I have just finished my weekly letter to the A.D.M.'s and then dug out my A.R.R.L. files to again read of the battle of the Rocky Mtn. Division. I read over the pile of files I have from the start. Everywhere thru the letters run the phrases "If we can," "I hope we can," etc., and then as I read the matter up to date it sure makes my heart feel good. It now sounds altogether different. All those fond dreams I had when we again started the ship towards the sea seem to have come about in some sort of a manner.

My plans seem to have fitted in OK and the co-operation I am receiving from the men gives me a lot more joy. Our stations are handling traffic by the hundreds of messages. Two broadcast stations have bent their energy toward relay traffic with their powerful sets. A daylight route has been opened and only needs a little polishing up to make it sound. Arrangements have been made with the railroad dispatchers over the country followed by our route that, in the event of another paralyzing storm like we had last May when all wires were out for three days, they are to call on us for assistance. We have a standing schedule with each other that when we are called upon we will call each other at 15-minute intervals until we establish communication and then handle the msgs. for the railroads for the safe operation of their trains. The Transcons will surely go thru this division. Good stations of large and small C.W. power are springing up all the time. The gang is "pepping up" and the sea looks smooth.

Gosh, O.M., what a wonderful age this old A.R.R.L. is living in. Just like a Frenchman, I could just kiss old Maxim for starting it, and can just barely imagine the satisfaction it must afford him to ponder over the struggle of the League and its approaching perfection. This is just a little rattling of a well pleased ham tonite, O.M. Must close now, with best o' luck and 73s to you and the gang.

Yours very truly,
Norman R. Hood.

Reinartz Super-Regeneration

Box 134-A, Route 6,
Omaha, Neb.

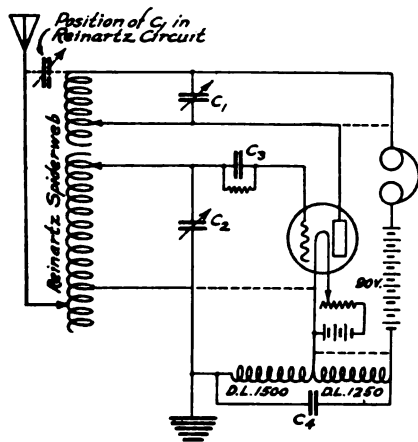
Editor, QST:

I have been watching closely the recent developments in super-regeneration. Have noted particularly the write-ups you have given it yourself. And in working along the lines of the one-tube set with the idea of incorporating the range and selectivity of the 3-circuit regenerator with the amplification of the super set, and obtaining over the whole a simplicity of adjustment and ease of control found only in the Reinartz circuit, we asked ourselves the obvious question—why not hook up a super set on our one-tube Reinartz, and if it doesn't explode see what selectivity we can get on it? Did it work? Oh Boy!

The Reinartz we used was that of last March's QST, without the one-stage amplifier. The super circuit we used was practically that originated by 3BID and described on page 17 of October QST, and the combination of the two made our two-stage look sick. The circuit is shown herewith; full lines show the present hook-up, while dotted lines indicate how the original Reinartz was changed.

During the Transatlantic Prelims, 2's,

3's, 6's and 7's came in like 9's on both spark and C.W., and it controls as easily as the original Reinartz if you are careful of your ears. Groves says it should work quietly but he may work near some boiler factory. We haven't the set working long enough to say much more about it, but we find the phone by-pass unnecessary, and the .002 variable across the DL's may be replaced with a fixed .0015 Micadon.



*C₁ 23 plate Variable Condenser
C₂ 13 plate "
C₃ .00025 Micadon & Leak
C₄ .0015 Micadon
Dotted lines show portions of original circuit to be removed*

In operating, set your switches at the approximate wave and refine the tuning with condensers C-1 and C-2, as on the original Reinartz. It will be noted that the tube will give moderate sigs at very low brilliancy, and for the sake of your ears should be used thus until you find the high spots of the set. After tuning in your man you can increase filament current until almost any desired audibility is reached. The set has a marked R.F. characteristic in that it amplifies the tuned sigs all out of proportion to QRM and QRN. DX has been heard right thru local phone, spark and C.W.

The set is subject to much refinement as yet, and we stand ready to receive suggestions. With all due credit to 1QP and 3BID, I beg to remain.

Fraternally yours,
P. H. Quimby, 9DXY.

We Should Worry

120 W. King St.,
Kitchener, Ont.

Editor, QST:

Yes. How does Beeswax get that way? "Who will save the amateur?" Well, well. In the first place, who told him that the amateur's circumstances were such as to warrant their needing such assistance?

Doesn't he know that the novice with brains has some idea of the rights of other people to the air, especially when these people are engaged in what amounts to research work destined to advance the science of radio? Does he really mean to insinuate that the American public are all boneheads?? I don't believe they are.

Give credit where credit is due; Radio News itself as a magazine is ahead of other periodicals of its class. As a "popular" magazine, I cannot see where anyone can kick on the technical articles, many being written by experts (NOT including the editor), but I feel sure that no amateur nor any person with any self respect or regard for the rights of others can agree with the editor's new policies regarding the amateur. If he (assuming that he still knows the code) would get on the air and hear the mob of C.W. stations there he would realize that amateur radio is just starting, not declining. If he would attend strictly to business and not go out knocking the amateurs and telling lies about them, he would rise a great deal in the estimation of the public. For instance, who does the would-be novice consult about installing a receiving set in most cases, but an amateur? Who usually helps him to get it working? Who made broadcasting possible? Yet the amateur is not recognized in the community! I have no kick coming on account of Mr. Gernsback's changing the style of Radio News so as to make it a better seller, because it is a business proposition with him and his company makes its living on the sale of Radio News, but a magazine can be made to sell without having to get up and knock everything in sight. My notion is that he is a shrewd business man but a --- poor editor.

Mr. Parkes is right. Let's ask the gang to quit knocking the novices, BCL's, RFL's, or whatever you want to call them. If they don't get interested in the code, they soon lose interest in radio anyway, as it is practically impossible to be sure of hearing a complete program from a distant broadcasting station nowadays due to carrier wave beat QRM, etc. and those who are interested only in the music (?) end of it seem to be getting disappointed, leaving the embryo amateurs, who listen down around 200 once in a while and wonder about the peepings that they hear there, as T.O.M. prophesied recently. This makes us feel optimistic.

In the next Junior Operator page, you should run a little article and cut about QRM traps to take mush from nearby C.W. stations out of receiving sets tuned to 360 meters. They work, and do it well.

Yours for amateur radio (C.W.),

H. S. Gowen,

City Mgr., Canadian 3DS.

Filament Adjustment

128 Melrose St.,
Melrose Hlds., Mass.

Editor, QST:

Mr. Miles' query in the October number brings up a question whose principles do not seem to be very generally understood, i.e., that of ammeter vs. voltmeter control for vacuum tube filaments.

During the burning of a tungsten filament the metal gradually evaporates away from the hot filament and deposits on the cold glass bulb. This causes the blackening often observed in old tungsten lamps. During this process the diameter of the filament slowly decreases, thus increasing its resistance. Thus, for the same rheostat setting, the potential drop across the filament slowly increases, while the current thru, it slowly decreases, but the net result is that the filament temperature *decreases*. Since the electron emission, and, consequently, the operation of the tube, is a function of the temp., we restore this value by cutting out some of the external resistance (rheostat). If we regulate this change by maintaining constant current (ammeter) the actual temp. of the filament slowly increases, whereas, if we use a voltmeter, the filament temp. at constant voltage slowly decreases. Thus neither meter *alone* permits operation at constant temperature.

By combining the two, however, we may operate at const. temp. by making use of Langmuir's relation $V \times \sqrt[3]{A} = \text{const.}$ where the temp. of the filament is const. if the voltage-cube root of amperage product is maintained constant.

Since many amateurs will hardly care to go to a double meter expense in this connection, and since the application of this principle in practise is somewhat inconvenient (except in scientific work) it might be well to point out that if only one meter is to be employed, it is safer to use the voltmeter, since at const. voltage the temp. is slowly decreasing. On the other hand, at constant current the temp. is increasing and the life of the tube decidedly shortened in its later stages, since evaporation of the tungsten metal rapidly increases with increasing temp. until the melting point of the metal is reached, or the filament becomes too fragile to withstand vibration, etc. However, this effect is of much less importance in the case of the thicker filaments used in power tubes, and here the use of the ammeter might be advisable.

It may be well to point out, also, that the operating characteristics of commercial vacuum tube filaments may vary considerably with tubes of the same make and type, due to the short filament length, and the exigencies of large scale production, and that the condition of max. operating efficiency should be determined for each individual tube. Thus I have a UV-200 tube

which operates best at 3.3 volts and is generally used at 3.0 volts for nearby stations, while rated by the manufacturer at 5.0-5.4 volts.

Very truly yours,
Stanley L. Chisholm.

QRT for the Tests

2CFA, 205 Midwood St.,
Brooklyn, N. Y.

Editor, QST:

Many is the time a man gets disgusted and would like to voice his sentiments to the general public. To be perfectly frank, I am going to ask you to publish this letter in QST, altho I feel sure you will get a great many more of a similar nature.

Amateur radio activity is a great thing in many respects but its control is far from being perfect and there still is the "ham" who is killing it instead of "lending a hand" to help things along. These preliminary tests for the coming second series of Transatlantic Tests have been ruined by a large number of men who seem to have a very selfish purpose in view. They apparently cast aside all rules and regulations which tend to put things on a systematic basis and thereby "gum up the whole works." Instead of standing by when their district is supposed to, during these tests, they open up with whatever they have and let her go with a CQ, a call of some kind, or chew the rag on full power with some bird about a block away. I started to log the various ones who were operating out of their turn but it was useless, as there were too many—that's the reason for the disgust. You can imagine listening in on amplification for DX signals only to have a number of men in your own district open up with 50-watt bottles, 1 and ½ k.w. spark sets. It's just plain ND. Many a fellow is going to miss getting cards from 1200 miles or more just on account of this local QRM.

Then too, aside from this, it seems that fellows are disregarding local work and working (or trying to) DX before 10 P.M. This is hurting A.R.R.L. traffic. You call a fellow with a "msg," morning, afternoon, or early evening, and you will not get a peep out of him—instead he is calling CQ about a hundred times or trying to work DX.

Please make another appeal to the real radio world to see if conditions can't be made better. I'm sure a great many others will join me in this feeling.

Yours for better and more systematic radio,

Clarence A. Kelting.

[Editor's Note: Please see our Editorials this month. The preliminaries are over but the finals come during December. Mr. Kelting is right—we need better co-operation, men. For ten days we're going to have plenty of transmission, and during

SOS--a la Wireless Willie

By Chas. A. Lowry

THE winter sun had set and the Citadel's bleak silhouette slowly faded, leaving the city to its war-time darkness. The dockyard gates closed and the sentries took up their posts by the tiny doors, thru which liberty-men and officers would shortly issue forth in little groups, on pleasure bent. Halifax had settled down for the night.

Halifax was, I suppose, much like all other strategic cities were, in those days; dark dismal streets, shop windows covered with black paint or heavily shuttered; street cars with blinds tightly drawn and not a street lamp anywhere. I wandered over to the Academy only to find a three year old movie film on the boards. The "Tally-Ho" and "Green Lantern" somehow failed to attract me that night. I wanted comedy and laughter to drive away from my thoughts the gruesome details of war, for I had just come in from patrol and was in a bit of a hump as a result. I decided to spend the rest of my short leave on board listening to the phonograph, or perhaps there might be others who, like myself, preferred the cosy wardroom to the muddy cobbles and fishy odors of Barrington Street; and it was with visions of a little game of stud or draw that I hastened to return to the little ship which for some months had been "home."



The old "Niobe," her glorious duty as a warship done, lay stupidly against her temporary quay, next Pier Six. Huge twin anchor chains extended from her hawse-pipes fore and aft, and were secured to concrete blocks on shore. In vain might

the changing tides suck at her wooden bottom, I thought; yet those same chains snapped like match-sticks when, a few weeks later, the fatal "Mont Blanc" went up. She was a repulsive sight, that old greyhound, as she lay there, a black silhouette against the starry Dartmouth sky; her four crooked funnels and the two tall spars and the ancient slope toward midships gave her a drooly, haunted aspect, in the darkness. Yet it was with a sort of nameless thrill that I mounted the



long "chicken run" and passed, thoughtlessly saluting, over the nameplate, thru the casemate door and down two decks below to the warrant flat. The lights were burning in the gun-room mess and the sound of muffled voices drifted thru the grating to my listening ears. Sure enough, here were friends, and plotting mischief too!

I entered, and here my story really begins.

Wireless Willie Westover was one of those youths of the Peck's-Bad-Boy type who is eternally plotting mischief. Together with three weary knights of the pill boxes, he had been futilely endeavoring to ward off an attack of just such a blue funk as possessed me. Draw, stud, rummy, and even crown and anchor had failed dismally. But Willie's brain never failed.

"Seen Gulsen, Marconi?" he asked, as I entered the mess. (They called me Marconi in those days, for some reason of their own). No, I hadn't seen him. "Must be up in the coop all right," he remarked. The aforesaid "coop" was a cabin about 4' x 4' x 7' containing a wild assortment of antique W/T receiving gear, and boasted the dignified name of "Silent Cabinet" in the rule book. This coop was soon to become the scene of the prank that Willie was already hatching from his fertile brain. A cabin boy was sent up-top and returned with the information that Mr. Gulsen was "in the wireless, Sir." Wireless Willie

(Continued on page 90)

Calls Heard



HEARD DURING OCTOBER Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls "double spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of an 8½" x 11" sheet.

(2) Arrange alphabetically thru each district, from 1 to 9, and then Canada, with no break between the districts, using commas to separate calls and parentheses around calls of stations also worked—as in examples below.

(3) The period covered by the report shall be so stated and shall be approximately from the first of one month to the first of the following month. All lists must be received by us the 8th of the following month for publication in the next QST.

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner and then make a second paragraph in identical form listing the C.W. stations. Commercial calls will not be published.

Now that everybody knows how to do it, let's have a better grade of lists with some real DX and fewer nearby calls. However, be absolutely sure of the calls you log and report.

H. A. Cookson, S. S. China—(1-Step)

October 22 (449 miles W. San Francisco): 5PX, 9BED, 9ANQ, 9AWM, 9CXP, 9DHB.

October 23 (845 miles W. San Francisco): 5BN, 7ZB, 7EN, 7NY, 7AEM, 7RI, 8SP (Fairmont, W. Va.), 8XE (State College, Pa.), calls 9GK, 9BED, 9DBL, 9AJH, 9DXN, 9AXU, 9PN, 9BJI, 9BIZ, 9XE, 9ZAF, 9BDS, 9FM, 9ZN, 9XM, 9GK, AD7. (Hear 8XE and 9GK working all evening).

October 24 (1210 miles W. San Francisco): 5ZA, 5CV, 5EO, 5ABH, 7BK, 7DP, 7SC, 7TQ, 8AIO (East Pittsburgh, Pa.), calls 6KA, 8BWA (Akron, Ohio) calls CQ, 8YU (Dayton, Ohio) calls CQ, 8NB (Rochester, N. Y.) calls 977, 9DK, 9AWM, 9BDS, 9AOG, 9CKM.

October 25 (1602 miles W. S. F.): 3BLF (?), 4HH (Tampa, Fla) heard twice, 4BV (Wilmington, N. C.) calls 9CNS, 5HA, 5ZA, 5NK, 5EO, 5SM, 5EK, 7ADF, 7RN, 7SC, 8XE (Pa.) calls CQ, 9BJ (Chicago), 9BK (Chicago), 9BJI, 9AXD? 9CMK, 9CNS calls CQ all night, 9GK copied working with an "8", msg says "want you here often sig 9DKB." 9GK very consistent & QSA, 9AWM calls 5EK, 9ZAF, 9AYI, 9BCY, 9ZAF, 9AUL QSA with 1CMK, 9BDS, 9ZN, 9BDE?

October 26 (1963 miles W. S. F.): 5XAD (?), 9XM (Madison, Wis.) very QSA and clear. Copied the following: "9XM test 9XM test psc card fm any stn beyond 1200 miles fm Madison Wis test de 9XM QRX for Amateur NA 9XM." HJ! Several other Nines heard but unable to read acct strong induction QRM fm engine room.

The best distances logged were 8NB, Oct. 24, approx 4200 miles; 8AIO, Oct. 24, approx 4100 miles; 9BJ & 9BK, Oct. 25, 4100 miles; 9XM, Oct. 26, about 4400 miles and 8XE about 4700 on Oct. 25.

[This was mailed from Honolulu. Operator Cookson expects to hear the sixes all the rest of the wry to Yokohama, Japan—Ed.]

T. W. Braidwood, S. S. City of St. Joseph

2000 miles E. of Sandy Hook: 1BDI, 1XM, 2FP, 2NZ, 3EL, 3ZO, 4BY; 1800 miles E. of Sandy Hook: 5NY; 1600 miles E. of Sandy Hook: 1XM, 2CQZ, 2EL, 3ZO; 1500 miles E. of Sandy Hook: 1AJU, 2ZK, 3BA, 4DC, 8FID, 9XAC, 9ZN; 900 miles E. of Sandy Hook: 1BKQ, 1OPN, 1XU, 2AWL, 2BLF, 3ARP, 3BGT, 3BWT, 3FS, 3RM, 3YD, 4NT, 4ZA, 8AXB, 8XE, 9APS, 9AMQ, 9BDS, 9KG, 9ZAF.

F. H. Stephens, Chicagoff, Alaska

The following telegram dated Nov. 14th is herewith printed as received: "Please print next issue Stop Yesterday copied on regenerative two step between nine ten and ten P.M. Coast time Stop Spark 9YAK CW 9AWM 7NY 9ZX 9YW 9ZN Stop 9AFD hundred test from cans 6ZAC 9CLS and 5AD Expect install fifty watt bottle Location excellent"

Canadian 5DO, Vancouver, B. C.

C.W.: 5DX, 5EO, 5PX, 5XD, 6CC, 6CJ, 6CP, 6HC, 6IY, 6GR, 6KA, 6XJ, 6PL, 6ZF, 6ZI, 6ZW, 6ZY, 6ZZ, 6ABX, 6AJH, 6AQW, 6AWT, 6AFQ, 6AGH, 6ARK, 6ATV, 6BKO, 6BVN, 6BCR, 6XAD, 6XAZ, 6XWI, 6ZAC, 7AW, 7BK, 7BJ, 7CP, 7GL, 7IY, 7SC, 7SF, 7TH, 7TQ, 7TY, 7VI, 7WF, 7WM, 7WX, 7XC, 7ZB, 7ZG, 7ZK, 9AU, 9AY, 9DR, 9RG, 9ANI, 9AUL, 9AWM, 9CNS, 9ZAF, BTs. Canadians: 4BV, 5CT, 9AC.

Spark: 6LU, 6AWM, 6ZIW, 6BWA, 7DK, 7ON, 7VE, 7VF, 7VG, 7ZG, 7ZK, Canadian 5DX.

3JT, 63 Bellwoods Ave., Toronto, Can.

Spark: 1ARY, 1BOQ, 2NF, 2OM, 2AGA, 2AJE, 2AK, 3FL, 3FP, 3HJ, 3SF, 3QN, 3AAO, 4BL, 8TJ, 8BDA, 9AAW, 9ABM, 9AVP, 9AWP, 9DHz.

C.W.: 1AW, 1CZ, 1FF, 1FG, 1FK, 1NN, 1PR, 1RD, 1XM, 1YK, 1AHZ, 1ASZ, 1AZM, 1AZW, 1BCF, 1AOK, 1BDI, 1BDT, 1BES, 1BET, 1BGF, 1BJN, 1BKA, 1BKQ, 1BLN, 1BQA, 1BRQ, 1CCK, 1CNF, 2FQ, 2FZ, 2GR, 2HW, 2JO, 2KF, 2LO, 2NF, 2NZ, 2SQ, 2UD, 2WB, 2XQ 1.C.W., 2XZ, 2AFP, 2AGH, 2AHO, 2AJW, 2AGC, 2AIM, 2AJA, 2APA, 2APD, 2APC, 2AWF, (2AWL), 2AWS, 2ADL, 2BEA, 2BGW, 2BJO, 2BMR, 2BQH, 2BRB 1.C.W., 2BSE, 2CBW, 2CCD, 2CCX, 2CDO, 2CFB, 2CJN, 2CKL, 2CQZ, 2CPK, 2CPD, 3BX, 3BG, 3CC, 3CD, 3DB, 3FJ, 3GK, 3GN, 3HL, 3LR, 3NH, 3OT, 3PB, 3PZ, 3QV, 3RM, 3VW, (3WF), (3YH), 3SM, 3YO, (3ZO), 3ZW, 3ZZ, 3AAJ, 3AFB, 3AJE, 3AJJ, 3ANJ, 3APB, 3APR, 3ARM, 3ASP, 3ATZ, 3AVA, 3AWW, 3ASY, 3BGT, 3BHL, 3BOF, 3BQX, 3BNU, 3BWA, 4BB, 4BQ, 4BS, 4BX, 4BY, 4DQ, 4EH, 4ID, 4GL, 4JK, 4KU, 4GH, 4LI, 4XK, 5DA, 5DI, 5DO, 5EK, 5FV, 5DK, 5HR, 5MB, 5NV, 5UK, 5XK, 5AAG, 5AAM, 5ADE, 6GR, 6KA, 7AD, 7AZ, 8AB, 8CF, 8CP, 8CU, 8DR, 8DV, 8HE, 8JQ, 8IB, 8ML, 8OW, 8SF, 8VE, 8RM, 8XE, (8YN), 8XB 1.C.W., 8ZD, 8ZX, 8ZZ, 8AAB, 8ACF, 8ACH, 8AFD, 8AGR, 8AIW, 8ANB, 8ANJ, 1.C.W. 8AQO, 8ATU, 8AVD, 8AWP, 8AXC, 8BEF, 8BFM, 8BGO, 8BHO, 8BJV, 8BPL, 8BWA, 8BXT, 8BX, 8BQJ, 8BZY, 8CEI, 8CET, 8CGJ, 8CPG, 8CGX, 8CGM, 8CJY, 8CMI, 8CWN, 8CQA, 8CRM, 8CKX, 8CYA, 8ZAF, 9AF, 9AI, 9DY, 9EI, 9GK, 9II, 9IO, 9IZ, 9GA.

90X, 9PW, 9UU, 9WC, 9YF, 9ZN I.C.W., 9AU, 9AAP, 9AFK, 9AFN, 9AMI, 9APS, 9BDS, 9BGH, 9BHL, 9BIK, 9BUD, 9CCS, 9GMI, 9GUC, 9CKM, 9DAG, 9DCR, 9DKY, 9DTM, 9DOZ, 9YAJ, 9DBV, Can. 3DH. Other Canadians too numerous to mention.

3GN-9BS, Ingersoll, Ont.

Spark: 1AW, 1JT, 1RV, 1BOQ, (1CNI), 2BG, (2BY), 2NF, 2OM, (2UA), (2AER), 2AHK, (2AJE), 2ARB, 2BDU, 2CCX, 3FB, (3FP), (3QN), 3ZM, 3ZO, 3ANS, (3ARM), (3AQR), 3AXN, 5XA, 8CY, 8EO, 8HY, (8LM), (8NZ), (8OI), (8TJ), 8UC, (8VH), 8VQ, 8VW, 8ZY, 8ACF, 8AFG, 8AMS, 8AWU, 8BDA, (8BGT), 8BQA, 8BVX, 8BXC, 8CEJ, 8CKV, (8CSD), (8CYD), (9CA), (9CP), 9JX, (9IV), 9MC, 9ME, 9OF, 9ON, 9PD, 9QC, 9TV, 9ZN, 8ZY, (9AAW), 9ABM, 9ACB, 9AIU, (9AMK), 9ANU, 9AQA, 9AVP, 9AZA, 9ZF, (9BOO), (9BTK), (9CIV), 9CTW, 9DAY, (9DCW), 9DHG, 9DHz, 9DXT, (9DZY), Canadians: (3BA), (3DL), 3FO, (3MN), (3NV), (3RY), (3VW).

C.W.: 1AW, 1CK, 1CY, 1GV, 1LD, 1OE, 1PR, 1QP, 1RD, 1TS, 1XN, 1XU, (1ZE), (1AGH), 1ARY, (1AWB), 1BCG, 1BDI, 1BGF, 1BKQ, 1BOQ, 1CGO, 1CJH, 1CNF, (2EL), 2FZ, (2GR), 2JW, 2LO, 2NZ, fone, 2PF, 2TS, 2XQ, 2ZK, 2ZL, 2AAB, 2ACC, 2AIF, 2AJA, 2AWF, 2AWL, 2BEA, 2BGM, 2BGN, 2BML, 2BMR, 2BRB, 2BRC, 2BVA, 2BZV, 2CBC, 2CCD, (2CCX), 2CFB, 2CKL, 2CKN, 2CKU, 2CMS, 2CQZ, 3BG, 3BR, 3CC, 3CG, 3FS, 3GK, 3HL, 3HX, 3JH, 3LR, 3NH, 3OD, 3OT, 3QV, 3RF, 3TK, 3YO, 3ZO, 3ZW, 3ZZ, 3AAO, 3AAY, 3AFB, 3AFU, 3AJJ, 3AJO, 3ANJ, 3APR, 3AQR, 3ASP, 3AUU, 3AWL, 3BGT, 3BHL, 3BHM, 3BHO, 3BIJ, 3BIT, 3BJY, 3BNG, 3BNU, 3BOF, 3BRW, 3BUV, 3BVC, 3CBM, 3CMB, 3CRD, 4BQ, 4BT, 4BX, 4BY, 4DL, 4EA, 4EB, 4EN, 4FE, 4FT, 4GL, 4HW, 4KC, 4KI, 4LJ, 4LP, 4TL, 4ZF, 5AA, 5DA, 5DI, 5DO, 5EG, 5EK, 5ER, 5ES, 5FV, 5HL, 5KC, 5MB, 5PX, 5SM, 5XA, 5XK, 5ZA, 5ZAS, 5ZAV, 6KA, 6XAD, AD7, (8AB), 8AG, 8AM, 8BF, 8ES, 8EW, 8FT, 8GA, 8HJ, 8HN, 8HT, 8HW, 8IB, 8IC, (8LT), 8MP, 8OM, 8OW, (8PT), 8QB, 8QK, 8RR, 8SB, 8SP, 8TX, 8UK, 8UZ, 8VF, (8VH), 8WE, 8XE, 8XY, 8YD, 8YN, 8ZK, 8ABV, 8ACO, 8ABH, 8ACR, 8AEG, 8AFD, 8AGN, 8AGO, (8AGR), 8AIM, 8AKP, (8ALC), 8AMM, 8AOL, 8APR, 8APT, 8AQO, 8ARD, 8ASL, 8ATU, 8AWN, (8AWP), 8AWT, 8AWZ, (8AXN), 8BCL, (8BCY), 8BDU, 8BEF, (8BJX), (8BKE), 8BLT, 8BNH, 8BNO, (8BOZ), 8BPC, 8BPL, 8BRM, 8BSF, 8BUM, 8BVR, 8BXH, 8BXT, 8BXX, 8CAK, (8CAZ), (8CEI), 8CGM, 8CGP, 8CGX, 8CIA, 8CJY, 8CJA, 8CKM, 8CLK, 8CMM, 8CMY, 8CRB, 8CRW, 8CTP, 8CUR, 8CYT, 8ZAE, 8ZAG, 9BO, 9CP, 9DZ, 9EI, 9II, 9IO, 9KP, 9LE, (9LQ), 9LV, 9LZ, (9OX), 9PI, 9PN, 9PQ, 9QE, 9UU, 9XI, (9ZN), 9ACD, 9AFK, 9AHH, 9AIU, 9AJH, 9AJP, 9AMH, 9AMI, 9AMQ, 9AND, 9AON, 9APS, 9AQH, 9AQM, 9ARR, 9ARZ, 9ASU, 9AUL, 9AVN, 9AWM, 9AWS, 9AXU, 9BDS, 9BED, 9BFN, 9BHQ, 9BIE, 9BIZ, 9BJY, 9BKZ, 9BLC, 9BPL, 9BQD, 9BQW, 9BRK, (9BTT), 9BTX, 9BKZ, 9BZI, 9CBA, 9CBW, 9CCS, 9CEB, 9CKM, 9CJA, 9CLN, 9CTV, 9CUI, 9DAY, 9DBL, 9DCR, 9DGE, 9DQG, 9DGT, (9DKY), 9DOF, 9DQU, 9DSM, 9DSW, 9DWW, 9DXN, 9DZB, 9XAC, 9YAJ, 9ZAA, Canadians: (3AD), 3AQ, 3BP, 3BV, 3CO, 3DH, (3DS), 3FC, 3JE, (3JI), 3JK, (3KO), 3KP, 3MB, 3NB, (3SP), 3SX, 3TL, (3XN), 3YH, 3ACJ, (9AL), 9AW.

1XM, Cambridge, Mass. (All Districts)

(Note: list of 2's, 3's, 8's, and 9's incomplete, separate list of CW's and sparks not kept—sori O.M.) (1AAC), (1ALO), (1AJZ), (1ASJ), (1AXB), (1AXR), (1AZL), (1BAS), (1BKQ), (1BKR), (1BQD), (1BYN), (1CBJ), (1CEV), (1CKS), (1CMK), (1CND), (1CNI), (1DV), (1FL), (1GV), (1II), (1LL), (1QA), (1QP), (1XU), (1YK), (2AAB), 2ABZ, (2AFP), (2AGC), (2AJA), (2AJE), 2AL, 2ANW, 2APA, (2AVE), 2AWF, (2AWL), 2AYK, 2BB, 2BBB, (2BGI), (2BJC), (2BMR), 2BQ, (2BRB), (2BRC), 2BSG, 2BUE, 2BUM, 2BWL, 2CBG, 2CBY, 2CGJ, 2CKN, 2CKR, 2CM, 2CMS, 2CNU, (2COL), 2CPN, (2CQZ), (2CT), 2CUK, 2DI, 2DQU, 2EL, (2FC), (2FP), 2GK, 2GR, 2HW, 2KL, (2KP), (2KU), 2LE,

(2NZ), (2OM), 2RM, (2RY), 2SQ, (2SZ), 2TS, (2UA), 2UD, 2ZK, 3AAO, 3AAY, 3ABC, 3AFB, (3AIS), 3AJJ, 3ANJ, 3ANX, 3ANZ, 3AQR, (3AVC), 3AWA, (3BB), (3BEI), 3BG, (3BGI), (3BHM), 3BHN, 3BIJ, (3BJI), 3BJY, 3BLU, 3BML, (3BNU), 3BOB, 3BVC, (3BUP), (3BX), 3CC, (3CM), (3CN), 3DC, (3FS), (3GK), (3HJ), 3HX, 3IL, 3JH, (3LR), 3MK, (3OE), 3OT, 3PB, 3BNE, 3SL, (3SM), 3SZ, 3UK, 3VW, 3XC, 3XN, 3YO, 3ZB, (3ZO), 3ZW, 4BQ, (4BX), 4BY, 4DC, 4DQ, 4EA, 4EB, (4EL), 4FD, (4FT), 4GH, 4GL, 4HH, 4ID, 4KL, 4LJ, 4NC, (4NT), 5AAM, 5AD, 5DO, 5EK, 5ER, (5FV), (5HB), 5HL, 5NK, 5NV, 5OL, 5SA, 5SI, 5SM, 5XAD, 5XK, 6KAD, 6ZL, 7SC, 8AB, 8ADH, 8AES, 8AEV, 8AFD, 8AGO, 8AIM, 8AIO, (8ATW), (8ALC), 8AMM, 8AMZ, 8ANJ, 8AOL, 8AQO, 8ASL, 8ASV, (8ATU), 8AVD, 8BDO, (8AWP), 8AX, 8AXN, 8BAH, 8BCL, 8BDA, 8BDO, 8BEP, 8BEY, 8BFM, 8BGG, 8BJV, 8BKE, 8BNU, 8BO, 8BPL, 8BPN, (8BRT), 8BTL, (8BVR), 8BVT, (8BWA), (8BWK), 8BXF, 8CEI, 8CER, 8CGX, 8CJY, 8CK, 8CKM, 8CMX, 8COI, 8CP, 8CPX, 8CRX, (8CTP), (8CUR), 8CWJ, 8FT, 8HJ, 8IB, 8KG, 8NB, 8OE, 8OW, 8QK, 8SB, 8SP, 8SV, 8TJ, 8UK, 8UP, 8UR, 8WR (8XE), 8YG, 8YN, 8YQ, 8ZD, 8ZO, 8ZV, 8ZY, (8ZZ), (9AAP), 9AAV, 9AAW, 9AFK, 9AFN, 9AIX, 9AJP, 9ANQ, 9AOG, 9AOT, (9APS), 9APW, 9ARV, (9AUL), 9AWF, (9AWM), 9AYH, 9BCT, 9BDS, 9BED, 9BFB, 9BFX, (9BHD), 9BIL, 9BKJ, 9BRD, 9BTM, 9BUD, 9BZI, 9CBA, 9CIV, 9CNS, (9CP), 9DCR, 9DEN, 9DFB, 9DFP, 9DG, 9DHz, 9DR, (9DWW), 9DXM, 9DYN, (9EI), 9GA, 9GK, 9HJ, (9II), 9LZ, 9OX, 9QM, 9RX, 9TR, 9UC, 9UU, (9VZ), 9XAC, 9XL, 9YAJ, 9YI, 9YM, 9YS, 9ZAF, 9ZAR, (9ZN), Canadians: 2AZ, 2BG, 3BP, 3BV, 3CO, 3DH, 3DI, 3DS, 3GK, 3GN, 3JI, 3JK, 3KO, 9AL, 9AW.

Specials: (NOC), NOF, CY-1.

1CBO, Concord, N. H. (2 steps, 8 districts)

1AW, 1AEH, 1AGH, 1AGL, 1AIL, 1AKB, 1AJC, 1AJU, 1AOK, 1AYZ, 1BAS, 1BEP, 1BJN, 1BKA, 1BKQ, 1BLR, 1BNK, 1BNZ, 1BRQ, 1BSJ, 1BWJ, 1BWY, 1CEC, 1CDG, 1CGO, 1CGR, 1CMK, 1CNF, 1CPN, 1EO, 1FX, 1GV, 1IL, 1II, 1JT, 1KM, 1QN, 1TS, 1XM 1XP 1XT 1XU, 1XX, 1YK, 1ZE, 2AAB, 2AAG, 2ABC, 2ABQ, 2ACV, 2AER, 2AFP, 2AGC, 2AJA, 2AJE, 2AJJ, 2ARY, 2ASI, 2AVC, 2AWF, 2AWL, 2AWS, 2AXK, 2AYV, 2BBB, 2BM, 2BFX, 2BGI, 2BGM, 2BJL, 2BJY, 2BOA, 2BRE, 2BRC, 2BUM, 2BZV, 2CBC, 2CBT, 2CBY, 2CCD, 2CIU, 2CJX, 2CKL, 2CKN, 2CMS, 2CNK, 2CPD, 2CQZ, 2CXX, 2EL, 2FC, 2FP, 2ZL, 2GK, 2GL, 2GR, 2HJ, 2HV, 2HW, 2KS, 2LE, 2LO, 2NZ, 2OM, 2RM, 2RY, 2RZ, 2UD, 2VH, 2XQ, 2ZK, 3AAY, 3AFB, 3AJH, 3AJK, 3AJW, 3ALA, 3ALN, 3ANO, 3AQH, 3ARM, 3ASY, 3AVC, 3BA, 3BB, 3BG, 3BZ, 3BEI, 3BER, 3BFQ, 3BHL, 3BHM, 3BIJ, 3BIT, 3BLF, 3BLU, 3BNG, 3BNU, 3BOF, 3BTY, 3BUF, 3BUV, 3BVA, 3BWT, 3CAQ, 3CG, 3CW, 3CER, 3DT, 3FS, 3GF, 3HG, 3HX, 3JH, 3JI, 3KH, 3NB, 3OD, 3OE, 3OT, 3PZ, 3QV, 3RF, 3SZ, 3TJ, 3YO, 3ZW, 4BH, 4BX, 4BY, 4CD, 4EB, 4FT, 4GH, 4ID, 4LJ, 5DA, 5DO, 5EK, 5FV, 5KC, 5MB, 5MY, 5SM, 5XK, 6XAD, 8AB, 8ACH, 8ACK, 8AEC, 8AEU, 8AFD, 8AFM, 8AGX, 8AHR, 8AIG, 8AIM, 8AIO, 8AJP, 8ALT, 8ALW, 8AMQ, 8ANJ, 8ASL, 8ASV, 8ATU, 8AWZ, 8AWP, 8AXB, 8AXC, 8BAF, 8BDU, 8BEO, 8BHO, 8BJX, 8BKU, 8BMK, 8BMM, 8BNJ, 8BNO, 8BNU, 8BOG, 8BPH, 8BPL, 8BRC, 8BRL, 8BRM, 8BUM, 8BVR, 8BVT, 8BWA, 8BXH, 8BYT, 8CAZ, 8CBG, 8CEI, 8CFK, 8CGP, 8CGQ, 8CJY, 8CJZ, 8CKO, 8CNW, 8CQK, 8CSE, 8CTP, 8CUP, 8CUR, 8EO, 8HJ, 8HX, 8KG, 8ML, 8NB, 8OW, 8QK, 8SB, 8SF, 8SP, 8SS, 8TX, 8UE, 8UO, 8XE, 8YM, 8ZD, 8ZK, 8ZX, 8ZZ, 9AAP, 9AAU, 9AAV, 9AAH, 9AJH, 9AMQ, 9ANQ, 9AON, 9APS, 9ARZ, 9AWF, 9AWM, 9AXU, 9AYU, 9BAK, 9BCB, 9BCT, 9BDS, 9BEY, 9BHD, 9BLY, 9CGK, 9CLN, 9CNV, 9CR, 9CVM, 9CXD, 9DCG, 9DDW, 9DFB, 9DGE, 9DQG, 9DKY, 9DR, 9DWQ, 9DYN, 9EI, 9GL, 9II, 9KP, 9LQ, 9OX, 9QR, 9UU, 9UZ, 9VZ, 9WC, 9XCC, 9YAJ, 9ZAF, 9ZN, Canadians: 3BP, 3CO, 3JK, 3DS, 9AL, 9AW.

IBNI, Saco, Me.

C.W.: (1CG), 1RH, (1BWJ), (1CSL), (1CDP), (1CSD), 1CGO, 2BLS, 2BCK, 2HW, 2HJ, (2NF), (2AWN), (2BZS), 2BOP, 3BRW, 3AUU, 3BVC, (3CG), (3BND), 3BNU, 3BAN, 3NG, (4BX), 4EG,

4XN (4NF), 5LA, (5ZA), 5BQ, 6BHD, (6ANY), 6BAH, (6AWR), 6ANX, 7ZY, (7ANZ), (7AE), 7EA, 7CK, (7IP), 7IT, (7UF), 7ABT, 8BTR, 8BWA, 8XE, 8UK, (8CHG), 8COY, (8APB), (8XA), 9II, (9AN), (9ZM), 9BQK, (9AXX), (9DX), Canadian (3FT), English (X05), (LS4)?

1BYN, Worcester, Mass., Reimartz and 1 Step
1's, 2's, 3's, & 8's, all to numerous
1AW, 2FP, 3ZO, 4BX, 5BV, 4EA, 4EB, 4EH, 4ET, 4GH, 4ID, 4JX, 4NT, 5DI, 5EK, 5ER, 5ES, 5FX, 5IF, 5NB, 5SM, 5UK, 5VA, 5XA, 5XK, 5AJA, 5XAD, 6KA, 6XAD, AD-6, 7HM, 7LU, 7ZO, AD-7, 8BO, 9GK, 9II, 9IO, 9KP, 9PI, 9PN, 9UL, 9UM, 9UZ, 9VL, 9VZ, 9XL, 9YI, 9YW, 9ZL, 9ZN, 9AAP, 9AHH, 9AHY, 9AIU, 9AIX, 9AIY, 9AJH, 9AOT, 9APS, 9APW, 9ASH, 9AUL, 9AWM, 9BCT, 9BDS, 9BED, 9BEP, 9BHD, 9BLC, 9BRK, 9CBA, 9DFB, 9DFH, 9DGE, 9XAC, 9YAJ, Canadians: 2AM, 3BP, 3CO, 3DH, 3DS, 3GN spk, 3JI, 9AW, 9AL.

1BOQ, Hotchkiss Radio Club, Lakeville, Conn.
Spark: (1ACH), 1ACO, 1ADC, 1AFP, (1AFR), 1AKC, 1AMD, 1AMF, (1AOK), 1ARY, (1AW), (1BCF), (1BJS), 1BOT, (1BPZ), (1BQL), 1BR, 1BRQ, 1BV, (1BYG), 1CGQ, (1CK), (1CKI), (1CNI), (1LZ), 1OE, (1OR), (1QO), 1RV, 1RX, (1SW), 2AAC, (2AAF), (2ABM), (2AJE), 2ARY, (2AVE), (2AX), (2BM), (2BY), (2CDR), (2SJK), 2DA, 2FP, (2OM), (2PV), (2SQ), 2WB, (3ACY), 3AIC, 3AHK, (3AQR), (3ARM), 3ARO, (3ARQ), 3AVC, (3AWE), (3AWF), (3BCQ), (3BEI), 3BG, 3BJ, 3CAQ, 3CS, 3ER, (3FB), 3HJ, 3JH, (3RW), 3SF, (3UC), (3UD), 4BC, 4BI, 4GN, 4KM, 4VT, 5XA, (5ABL), (5ACF), (5AFG), (5AJT), 5APB, (5AVJ), 5AXB, (5AXN), (5AXQ), (5AXX), (5AYC), 5AZF, 5BAH, (5BDA), 5BEP, (5BFY), (5BGT), 5BLS, 5BMK, 5BOV, 5BPL, 5BQA, 5BRH, 5BRL, 5BSN, 5BVX, 5BWD, (5BXC), (5CAG), (5CER), 5CGU, 5CH, 5CKV, 5COL, 5CS, (5CSD), 5CYT, 5CYU, 5EM, 5EV, (5EW), 5HY, 5KY, 5LH, 5NY, 5PJ, (5RQ), (5TJ), 5UO, 5UC, 5VF, (5VW), (5VW), 5WE, 5XE, 5ZY, 9AAW, 9AFK, 9AIR, 9ANP, 9ARD, 9ASJ, 9AVF, 9AVP, 9AZF, 9AZA, 9BEF, 9BJE, 9BX, 9CGX, 9CPQ, 9CP, 9DAG, 9CSU, 9DAY, 9DCF, 9DHG, 9DHz, 9DIU, 9DTN, 9DXE, 9DXT, 9IJ, 9MC, 9OF, 9UU, 9VZ, 9ZN, Canadian 3BP, (3FO), (3GE), (3GN), (3BS).

C.W.: 1ADN, 1AFP, 1AFV, (1ACH), 1AGI, 1AGS, 1AIK, 1AJP, (1AJU), 1AJW, 1AM, 1ARK, 1ARQ, 1ARY, 1ASF, 1ATJ, 1AW, 1AWQ, 1AX, (1AXI), (1AYQ), 1AYZ, 1AZW, 1RAS, 1BBM, 1BCF, 1BDC, 1BDI, 1BEA, 1BET, (1BGF), 1BGN, 1BHI, 1BJA, 1BJN, (1BKQ), 1BNT, 1BOA, 1BOM, 1BQA, 1BQD, 1BQI, 1BQK (1BRH), 1BRI, 1BRQ, 1BSA, 1BSC, 1BSJ, (1BVH), 1BVR, 1RWJ, 1RWY, 1BZF, 1CAC, 1CAL, 1CAZ, 1CRH, (1CBP), 1CDB, (1CDO), 1CFI, 1CGO, 1CGQ, 1CGR, 1CGS, 1CJA, 1CJH, 1CJZ, 1CK, 1CKH, (1CLN), 1CM, (1CNE), 1CFN, 1CPZ, 1CTC, 1CUE, 1CUF, 1EZ, 1GV, 1HK, 1KM, 1II, 1IL, 1OK, 1PR, (1QP), 1SH, 1SQ, (1TS), (1UJ), 1XH, 1XM, 1XP, 1XU, 1XX, 1YK, 1ZE, (2AAB), 2ACU, 2AFP, 2AGB, 2AGC, 2AJA, 2AJL, 2ALJ, 2AM, 2ANM, 2APA, 2AUZ, 2AVC, 2AWF, 2AWL, (2BBB), 2BBM, 2BCK, 2BDK, 2BDU, 2BGI, 2BGM, 2BII, 2BJO, 2BKQ, 2BLJ, 2BLS, 2BML, 2BQD, 2BQI, 2BQO, 2BQU, 2BRB, (2BRC), 2BRQ, 2BRS, 2BYC, 2BZV, 2CBC, 2CBW, 2CCD, 2BLS, 2BML, 2BQD, 2BQI, 2BQO, 2BQU, 2BRB, (2BRC), 2BRQ, 2BRS, 2BYC, 2BZV, 2CBW, 2CCD, 2CDC, 2CGJ, 2CIN, 2CKL, 2CKN, 2CKR, 2CMS, 2CNP, 2COL, 2CQO, (2CQZ), 2DAW, 2DIR, 2DMR, 2EL, 2FC, 2FP, 2FT, 2GK, 2KE, 2KL, 2KP, 2NZ, 2OF, 2PF, 2RR, 2RM, 2RY, (2TS), 2UD, 2VZ, 2WB, 2XG, 2ZK, 2ZL, 3AAV, 3AC, 3ADE, 3ADT, 3AEV, 3AFB, 3AFC, 3AGC, 3AJD, 3AJJ, 3ANJ, 3ANO, 3ANZ, 3APA, 3APC, 3APR, 3AQR, 3ASP, 3ATG, 3AUB, 3AUU, 3AUW, 3BEK, (3BG), 3BGT, 3BGX, 3BHL, 3BHM, 3BIF, 3BIT, 3BIW, 3BKQ, 3BLF, 3BLU, 3BML, (3BNU), (3BOP), 3BRW, (3BTY), 3BUC, 3BUP, (3BVA), 3BVC, 3BVH, 3BVL, 3BWT, 3BZ, 3CA, 3CAQ, 3CAV, 3CHM, 3CC, 3CO, 3DH, 3DZ, 3FS, 3GC, 3GE, 3GK, 3GM, 3HL, 3HX, 3HZ, 3IP, (3IW), 3JH, 3JT, 3KM, 3NH, 3OA, 3OE, 3OD, 3OT, 3PB, 3PZ, 3QE, 3QV, 3RR, 3SZ, 3VW, (3VX), 3XM, 3YO, 3ZK, 3ZO, 3ZU, 3ZW, 3ZZ, 4AS, 4BB, 4BX, 4BY, 4DC, 4DM, 4DQ, 4EA, 4EB, 4EH, 4EI, 4EN, 4FB, 4FG, 4FT, 4GH, 4GL, 4HW

4ID, 4JK, 4LJ, 4LO, 4NT, 4PR, 4OI, 5AAG, 5AAM, 5ADE, 5ATE, 5DA, 5DI, 5DO, 5EK, 5FV, 5HE, 5LK, 5NT, 5NV, 5OS, 5PB, 5PX, 5SK, 5SM, 5XAD, 5XD, 5XK, 5ZA, 6KA, 6XAD, 7AFW, 8AB, 8ABC, 8ABN, 8ABS, 8ACN, 8ACT, (8ADH), 8AED, 8AFD, 8AFT, 8AGR, 8AGX, 8AIM, 8AIZ, 8ALC, 8ALD, 8ALF, 8ALT, 8AMP, 8AMQ, 8AN, 8ANB, 8ANJ, 8ANX, 8AOL, 8APT, 8APY, 8AQO, 8ASV, 8ATU, 8AVD, 8AVL, (8AWP), 8BAE, 8BBT, 8BDR, 8BDN, 8BEF, 8BEM, (8BEO), 8BFM, 8BFH, 8BFY, 8BIP, 8BIQ, 8BJS, 8AXB, 8AXC, 8AXN, 8AZD, (8BJV), 8BJX, 8BKE, 8BKN, 8BMM, 8BNJ, 8BNN, (8BO), 8BOQ, 8BOZ, 8BPH, 8BPN, 8BPU, 8BSF, 8BRM, 8BRQ, 8BTL, 8BTO, 8BTR, 8BUC, 8BVR, 8BVX, 8BWA, 8BWD, 8BXH, 8BXX, 8BYF, 8BZY, 8CAY, 8CAZ, 8CCS, 8CEI, 8CEP, 8CF, 8CFP, 8CGB, 8CGQ, 8CGX, 8CJN, 8CJY, 8CKK, 8CKM, (8CKO), 8CML, 8CMY, 8CNW, 8CNT, 8COA, 8CQA, 8CRC, 8CTN, 8CUR, 8CUS, 8CV, 8CYO, 8CYT, 8CZK, 8CZP, 8CZZ, 8DAK, 8DFB, 8DR, (8FQ), 8HH, 8HJ, 8HW, (8IK), 8JQ, 8KQ, 8ML, 8NB, 8OE, 8OQ, 8OW, 8PD, 8PJ, 8QD, 8QK, 8RJ, 8SB, 8SP, 8TK, 8UZ, 8VF, 8WA, 8WJ, 8XAE, 8SE, 8XH, 8XJ, 8YD, 8YG, 8YN, 8ZAE, 8ZAG, 8ZD, 8ZF, 8ZK, 8ZW, (8ZZ, also fone) 9AAP, 9AAV, 9AFK, 9AFT, 9AGT, 9AHH, 9AHQ, 9AJH, 9AJP, 9AJT, 9AL, 9ALP, 9AMI, 9AMO, 9ANQ, 9AOG, 9AON, 9APS, 9AQM, 9ARM, 9ARR, 9ATN, 9AUG, 9AUL, 9AVP, 9AW, 9AWF, 9AWM, 9AWR, 9AWZ, 9AXU, 9AZM, 9BBF, 9BBQ, 9BCB, 9BCF, 9BCT, 9BDS, 9BED, 9BEV, 9BEY, 9BGH, 9BHD, 9BIG, 9BIK, 9BIV, 9BJO, 9BJP, 9BLO, 9BRK, 9BSZ, 9BVE, 9BWS, 9BXT, 9CBA, 9CDB, 9CDY, 9CGK, 9CGN, 9CIP, 9CIV, 9CNN, 9CMK, 9CP, 9CTE, 9CTF, 9CVC, 9DCG, 9DCU, 9DDW, 9DDY, 9DEL, 9DFB, 9DHz, 9DKY, 9DOZ, 9DQA, 9DQU, 9DR, 9DSM, 9DTJ, 9DWQ, 9DYN, 9DM, 9EBI, 9EI, 9EJ, 9FM, 9GK, 9GX, 9HW, 9II, 9IO, 9KP, 9LZ, 9NS, 9NU, 9OF, 9OQ, 9OX, 9PN, 9PW, 9QF, 9SL, 9UC, 9UD, 9UU, 9UZ, 9VZ, 9WC, 9XAC, 9XL, 9XX, 9YM, 9ZAF, 9ZN, Canadians 3CO, 3DH, 3DS, 3JJ, 3JK, 3KD, 3NX, 9AL, 9AW.

2CAD, 310 Ave. E., Bayonne, N. J.

C.W.: 1AW, 1ES, 1IV, 1RD, 1SD, 1SQ, 1XM, 1XU, 1XX, 1AIQ, 1AJU, 1AKG, 1ARY, 1AWB, 1AZL, 1AZW, 1BDI, 1BEP, 1BET, 1BGF, 1BJN, 1BKA, 1BQK, 1CDO, 1CJA, 1CMK, 1CNF, 1CPN, 3BG, 3DH, 3FS, 3HS, 3JK, 3KO, 3LP, 3NH, 3XO, 3YO, 3ZO, 3ZW, 3AFB, 3ALN, 3AIS, 3APR, 3AVC, 3BAJ, 3BHL, 3BIT, 3BLF, 3BNU, 3BUV, 3BVC, 3CCC, 4BQ, 4BX, 4DC, 4DL, 4EH, 4EN, 4FT, 4GH, 4ID, 4JY, 4KM, 4NT, 4NY, 5DA, 5DO, 5EK, 5ER, 5FV, 5SM, 5XA, 5XK, 5XM, 5ZA, 5ZAV, 5EN, 6GK, 6KA, 6UW, 6ABX, 7LU, 8BK, 8CF, 8FQ, 8HJ, 8HH, 8IB, 8IQ, 8JQ, 8KG, 8OW, 8PD, 8PT, 8QK, 8QM, 8SB, 8SP, 8UE, 8UK, 8VE, 8VY, 8XE, 8XH, 8YD, 8ZD, 8ZV, 8ZR, 8Z, 8ZZ, 8ACF, 8ACH, 8ADH, 8ADM, 8AFD, 8AFY, 8AGO, 8AIM, 8AIO, 8AME, 8AMN, 8AMQ, 8ANJ, 8ANY, 8AQO, 8ASV, 8AWP, 8AWX, 8AXB, 8AXC, 8AXN, 8BDB, 8BEF, 8BFM, 8BJS, 8BOZ, 8BUM, 8BVT, 8BZY, 8CAY, 8CAZ, 8CEI, 8CEP, 8CGX, 8CJX, 8CLK, 8CNW, 8COI, 8CQY, 8CUR, 8CTP, 8CYT, 9CP, 9FF, 9HW, 9II, 9IO, 9KP, 9LQ, 9OF, 9OX, 9PF, 9UH, 9VK, 9XL, 9ZN, 9AAP, 9AAU, 9AFN, 9AFT, 9AHH, 9ANQ, 9APS, 9AWM, 9BDS, 9BED, 9BIK, 9BIZ, 9BJY, 9BRK, 9BVP, 9BYA, 9CBA, 9CPX, 9CLN, 9DYN, 9DKS, 9DMM, 9DKY, 9DOZ, 9YAJ, 9XAC, 9ZAA, Canadians 3BP, 3JI, 4JK, 9AW.

Spark: 1BOQ, 3ACY, 8TJ, 9CP, 9UH, 9ZN, 9AAW, 9DHz, Canadian 3GE.
Daylite C.W.: 1AGH, 1AJP, 1BKQ, 1BSA, 2HW, 2AWF, 2CGJ, 3CC, 3CG, 3OJ, 3OT, 3VW, 8ABN, 9GV.

Jack Dunham, New Rochelle, N. Y. (1 tube all over 750 miles.)

C.W.: 4BY, 4EB, 4HW, 4KK, 4OI, 5EK, 5ER, 5FV, 5HB, 5KC, 5PS, 5QY, 5XA, 5XAD, 5ZAV, 9AAP, 9AAU, 9AAV, 9AFK, 9AFN, 9AIY, 9AJH, 9AJP, 9AKB, 9AL, 9AMI, 9ANQ, 9AON, 9AOT, 9APS, 9APW, 9AUL, 9AVH, 9AW, 9AWF, 9AWM, 9BCB, 9BCH, 9BDS, 9BED, 9BIG, 9BJY, 9BLY, 9BNV, 9CAH, 9DCF, 9DGE, 9DKY, 9DQU, 9DR, 9DVK, 9DWQ, 9DYN, 9DZ, 9EI, 9EV, 9FM, 9GK, 9GL, 9KG, 9PW, 9UU, 9VZ, 9XAC, 9XAK, 9YAJ, 9YM, 9ZAA, 9ZAF, 9ZN.

2AWF, Albany, N. Y.

Spark: 1AKC, 1BOT, 1BQL, 8CK, 1CNI, 1GM, 2AJE, 2ARB, 2AX, 2BSC, 2OM, 2SQ, 2WB, 3ACY, 3CN, 3HJ, 3RW, 3YC, 3ACF, 3AXQ, 3BRL, 3EW, 3UC, 3VQ, 3XE, 3AVP, 3MC, Can., 3BP, 3FO, 3GE.

C.W.: 1AGH, 1AJL, 1AOK, 1AW, (1AWB), (1AWW), 1BDI, 1BJN, 1BJY, 1BKA, (1BKQ), 1BLN, 1BQI, 1BRQ, 1BSC, 1CGR, (1CMK), 1CPN, 1GV, 1HK, 1IL, 1PR, (1RD), 1TS, 1UU, 1XM, 1XU, (1YK), 1ZE, 2AAB, 2ABC, 2AEH, 2AER, 2AGC, 2AJW, 2APA, (2APD), 2AQT, 2AWL, 2AWM, 2AWS, 2AXK, 2BBL, (2BMS), 2BNZ, (2BTW), 2BYC, 2CBW, 2CXY, 2CFB, 2CIM, 2CMS, 2EL, 2FC, 2FP, 2FZ, 2JW, 2NZ, (2RM), 2TS, 2XZ, 2ZL, 3AAY, (3AIS), 3ALN, (3AMX), 3ANJ, 3ATZ, 3AUW, 3AVA, 3AVC, 3AWA, 3BBR, 3BG, 3BGT, 3BGU, 3BHL, 3BHM, (3BIJ), 3BJF, 3BNU, 3BSB, 3BUV, 3BUA, 3BVC, 3BX, 3CAQ, 3CC, (3CG), 3CKX, 3DC, 3FS, (3GK), 3IL, 3IW, 3JG, 3JH, 3JJ, 3LR, 3MR, 3NH, 3OD, 3OE, 3SM, 3SO, 3VW, 3VX, 3ZO, 4BQ, 4BX, 4BY, 4CY, (4DC), (4DL), 4DO, 4DQ, 4EA, 4EB, 4EH, 4FG, 4FT, 4GH, 4ID, 4JK, 4KC, 4KI, 4LJ, (4NT), 4XD, 5AA, 5AAG, 5AAR, 5BQ, 5DA, 5DO, 5EK, 5ER, 5ES, 5FV, 5GI, 5HL, 5IR, 5KC, 5MY, 5FX, 5QY, 5SM, 5TJ, 5UJ, 5VO, 5XAD, 5XA, 5XK, 5ZA, 5ZAV, 5XAD, 7ZO, 8AB, 8ACH, 8ADH, (8AGR), 8AGO, 8AIM, 8AIW, (8ALU), (8AMM), 8ASV, (8ATU), 8AVL, (8AWP), 8AWT, 8AXC, 8BDO, 8BFX, 8BGJ, 8BJO, 8BKE, 8BCL, 8BMM, 8BNJ, 8BOA, (8BPI), (8BPN), 8BRM, 8BRK, 8BUX, 8BVT, 8BWA, 8CAY, 8CAZ, 8CGP, 8CVZ, 8CKM, (8CKO), 8CMI, 8CNW, 8COI, 8CON, (8CSE), 8CUR, 8CYT, 8CZC, 8DAK, (8EO), 8FT, 8HJ, 8KG, 8ML, 8OM, 8OW, 8PJ, 8QC, 8QK, 8RJ, 8SB, 8SP, 8SS, 8VY, 8XE, 8YD, 8YM, 8YN, 8ZAE, 8ZV, 8ZX, 8ZZ, 9AAP, 9APD, 9AFN, 9AHH, 9AIX, 9AIY, 9AJF, 9AKD, 9AMH, (9AMI), 9AMO, 9ANI, 9ANN, 9ANQ, 9ANZ, 9AOG, 9AON, 9APS, 9APW, (9AQM), 9ARK, 9ARZ, 9ATX, 9AUL, 9AWF, 9AWM, 9AXU, 9BCF, 9BCH, (9BDS), 9BED, 9BHD, 9BHQ, 9BIZ, 9BLC, 9BLT, 9BVR, 9BZI, 9CAH, 9CBA, 9CDA, 9CGB, 9CLN, 9CKM, 9CNV, 9CPY, 9CTB, 9DBL, 9DBV, 9DDY, 9DFB, 9DGO, 9DKY, 9DLK, 9DOZ, 9DQU, 9DYN, 9EI, 9EJ, 9HW, 9II, (9IO), 9IX, 9KM, 9KP, 9OX, 9PF, 9PN, 9PQ, (9QU), 9VK, 9WA, 9XAC, 9XL, 9YAJ, 9YM, 9ZAA, 9ZN, Can. 2AM, 3BS, 3BV, 3CO, 3DH, 3GE, 3GN, 3NB, 9AL.

2AGH, Caldwell, N. J.

1AGH, 1AJU, 1ATJ, 1AYZ, 1AWW, 1BAS, 1BDI, 1BES, 1BKQ, 1BLN, 1BLW, 1BNJ, 1BOQ, 1BWJ, 1BYN, 1CAJ, 1CBP, 1CFN, 1CGQ, 1CGR, 1CMJ, 1CNE, 1CNL, 1CPN, 1DX, 1HK, 1KM, 1ML, 1SD, 1UJ, 1XM, 1XP, 1XU, 1XX, 3AFB, 3AJJ, 3ANJ, 3AOH, 3ASI, 3BHM, 3BIJ, 3BLF, 3BLU, 3BNU, 3BRW, 3BUT, 3BVA, 3CAQ, 3BX, 3BZ, 3CA, 3CC, 3CG, 3FS, 3HL, 3IW, 3KD, 3JD, 3OD, 3NH, 3OE, 3OT, 3PZ, 3QV, 3RF, 3SM, 3SZ, 3VN, 3VX, 3YO, 3ZO, 3ZW, 4BX, 4DQ, 4DL, 4EB, 4FG, 4FK, 4GH, 4HW, 4ID, 4KI, 4LP, 5DI, 5EG, 5FV, 5HB, 5JJ, 5PF, 5KC, 5SM, 5XA, 5XAD, 5XK, 5YD, 6EA, 6KA, 6XAD, 7ZO, 8ACF, 8ADH, 8AGO, 8AGR, 8AIM, 8AIO, 8AKP, 8ALF, 8AMQ, 8AMV, 8ANT, 8ANB, 8APT, 8ASV, 8AWP, 8AWZ, 8AXN, 8BCL, 8BDV, 8BED, 8BEO, 8BFM, 8BFS, 8BHO, 8BIP, 8BJV, 8BJX, 8BKE, 8BMK, 8BMM, 8BNN, 8BUM, 8BUX, 8BWA, 8BWK, 8BXH, 8BYT, 8BO, 8CAY, 8CAZ, 8CBX, 8CBC, 8CCS, 8CEI, 8CFP, 8CGM, 8CGU, 8CGX, 8CJH, 8CKL, 8CMI, 8CNT, 8CPO, 8CPX, 8CRB, 8CTP, 8CWW, 8CXT, 8CYT, 8CZZ, 8FG, 8CG, 8DAA, 8FY, 8HJ, 8IJ, 8JU, 8JP, 8IK, 8KG, 8LT, 8LM, 8NB, 8PD, 8QK, 8SP, 8TT, 8VF, 8VY, 8XE, 8YU, 8YN, 8ZAE, 8ZAG, 8ZZ, 9AAV, 9AFN, 9AHH, 9AHN, 9AIY, 9AJH, 9AJP, 9ANQ, 9AOG, 9AON, 9APS, 9AA, 9BED, 9BHD, 9BIF, 9BIV, 9BFT, 9BKH, 9BKK, 9BLG, 9BLC, 9BRS, 9BVP, 9CBA, 9CDA, 9CEE, 9CGT, 9CPY, 9CTR, 9CXP, 9DAH, 9DBL, 9DCF, 9DCR, 9DFB, 9DGE, 9DQU, 9DSM, 9DWW, 9DYN, 9DYY, 9EI, 9DR, 9EX, 9MC, 9ON, 9OX, 9VZ, 9YU, 9ZN, 9ZV, Canadians 2AM, 3JK, 3FO, 4BY.

2AFP, Paterson, N. J.

C.W.: 1AGH, 1AJP, 1AJU, 1AKG, 1AOK, 1AP, 1ARK, 1ASF, 1AW, 1AYZ, 1AZW, 1BEP, 1BET, 1BGF, 1BJN, 1BKQ, 1BPN, 1BQA, 1BWJ,

1BZP, 1CDO, 1CGO, 1CGR, 1CJA, 1CK, 1CKE, 1CKM, 1CNF, 1CPN, 1CSL, 1DV, 1GV, 1HZ, 1IL, 1KM, 1LL, 1RD, 1RU, (1XM), 1XP, 1ZE, 3AAO, 3ADT, 3AFB, 3AJA, 3AJJ, 3ANJ, 3ANZ, 3APR, 3AQH, 3AS, 3ASI, 3AUU, 3AVA, 3AVC, 3AWA, 3BAS, 3BEL, 3BFU, 3BG, 3BHI, 3BIJ, 3BIT, 3BIY, 3BJY, 3BLU, 3BLZ, 3BNU, 3BTY, 3BVA, 3BX, 3BZ, 3CA, 3CG, 3FB, 3FS, 3GC, 3GF, 3GH, 3GK, 3HW, 3JH, 3LP, 3LR, 3MK, 3NH, 3OE, 3OT, 3PB, 3PZ, 3QV, 3SM, 3SZ, 3XM, 3ZO, 3ZW, 3ZZ, 4BF, 4BK, 4BX, 4BY, 4CG, 4CY, 4DC, 4DL, 4DQ, 4EA, 4EB, 4EH, 4EL, 4EN, 4EU, (4FT), 4HW, 4ID, 4JE, 4JK, 4JZ, 4KM, 4LJ, 4LP, 4NT, 4NV, 4UA, 4XK, 4ZK, 5AAM, 5ADE, (5DA), 5DO, 5EG, 5EK, 5ER, (5ES), 5FV, 5IE, 5KC, 5MA, 5NV, 5PF, 5PV, 5PX, 5QL, 5RK, 5SA, 5SM, 5UJ, 5XAD, 5XAE, 5XK, 5ZA, 5ZAA, 5ZAT, 5ZAV, 6ABX, 6ALE, 6JL, 6KA, 6XAD, 6ZZ, 8ACH, 8ADP, 8AGO, 8AGR, 8AHR, 8AIM, 8AIO, 8AIW, 8AJP, 8AJT, 8ALU, 8AME, 8AMQ, 8ANB, 8ANJ, 8APT, 8AQO, 8ARD, 8ASV, 8ATU, 8AWP, 8AWZ, 8AXB, 8AXC, 8AXN, 8BCL, 8BDU, 8BEF, 8BFM, 8FX, 8BHO, 8BJV, 8BK, 8BMM, 8BNJ, 8BO, 8BPH, 8BPL, 8BPM, 8BPU, 8BRL, 8BRT, 8BVR, 8BWA, 8BXH, (8BXT), 8BYT, 8CAZ, (8CBC), 8CEP, 8CF, 8CGB, 8CGP, 8CGQ, 8CGU, 8CJX, (8CJY), 8CMI, 8CNA, 8CNW, 8CPX, (8CTN), 8CTP, 8CUR, 8CUV, 8CYT, 8DR, 8FS, 8HN, 8IB, 8JZ, 8KG, 8LF, 8LT, 8ML, 8OE, 8OW, 8QK, 8SCU, 8SF, 8SF, 8UK, 8UQ, 8UZ, 8XAE, (8XE), 8XH, 8XJ, 8XV, 8YE, 8YG, 8YN, 8ZAE, 8ZD, 8ZV, 8ZX, 8ZY, 8ZZ, 9AAP, 9AAU, 9ACB, 9AEF, 9AFK, 9AFN, 9AGZ, 9AHH, 9AHQ, 9AIF, 9AIY, 9AJH, 9AJP, 9AMI, 9AMT, 9ANF, 9AON, 9APS, (9AQM), 9ARW, 9ASE, 9ATX, 9AUL, 9AWF, 9AXU, 9BAK, 9BCF, (9BDS), 9BED, 9BHD, 9BIE, 9BJY, 9BLO, 9BRK, 9BVP, 9CVA, 9CGV, 9CCM, 9CEB, 9CJA, 9CR, 9CXP, 9DCR, 9DCU, 9DFB, 9DQG, 9DKY, 9DOZ, 9DQU, 9DSW, 9DVN, 9DYN, 9DZW, 9DZY, 9EBI, 9EI, 9GA, 9GL, 9II, 9IO, 9KH, 9LQ, 9LZ, 9NU, 9OX, 9PI, 9PQ, 9PW, 9UU, 9UZ, 9VK, 9VC, 9WC, 9XAC, 9XAQ, 9XL, 9YAJ, 9YB, 9YM, 9ZAF, 9ZN, Can., 2AM, 2BG, 3BV, 3CO, 3DH, 3DS, 3GK, 3JI, 3JK, 3JT, 3NB, 3SK, 3SX, 4BV, 9AL, 9AW, 9SO.

Spark: 1BPZ, 1CK, 8ARM, 8AWF, 3CN, 3FB, 3HJ, 3UD, 8ABL, 8ACF, 8AFG, 8BDA, 8CKX, 8COA, 8MZ, 8VQ, 9AZE, 9DDZ, 9DHZ, 9WD, Can., 3FO, 3GE, 3GN.

3BMN, Petersburg, Va. (1 Tube)

C.W.: 1KM, 1XM, 1AGH, 1AJU, 1AYQ, 1AZL, 1BOQ, 1BOZ, 1BRQ, 1CDO, 1CGO, 1CGR, 1CMK, 2CC, 2ER, 2GK, 2GR, 2HJ, 2KE, 2NZ, 2RB, 2ZQ, 2WB, 2ZK, 2AAB, 2AFB, 2AJA, 2AUE, 2AVE, 2AVK, 2AWS, 2BAY, 2BBB, 2BDM, 2BFX, 2FGL, 2BNZ, 2BQD, 2BQU, 2BRB, 2BUE, 2CBW, 2CCD, 2CMS, 2COL, 2CQZ, 2CZZ, 3BA, 3BG, 3BZ, 3CA, 3CC, 3CG, 3CQ, 3FS, 3HL, 3HW, 3HX, 3IW, 3JJ, 3LP, 3MB, 3MT, 3OE, 3OT, 3QV, 3RF, 3RV, 3SM, 3TJ, 3VW, 3YU, 3ZW, 3AAY, 3AEV, 3AFB, 3AGC, 3AHP, 3AJJ, 3AMH, 3ANJ, 3AQH, 3AQB, 3ASY, 3AUU, 3AVC, 3BHL, 3BHM, 3BIJ, 3BNU, 3BLF, 3BVA, 3BLU, 3BQX, 3BTY, 3BUV, 3BVC, 3BVM, 3BVL, 3BWT, 3CAN, 3CAQ, 3CBM, 4BX, 4DC, 4DL, 4DQ, 4EB, 4EH, 4EL, 4FT, 4GH, 4HW, 4ID, 4JK, 4JY, 4KC, 4KI, 4LJ, 4MN, 4NT, 4NV, 5EG, 5EK, 5FV, 5KC, 5MB, 5XA, 5XK, 5AAM, 5XAD, 8AX, 8CP, 8FT, 8HH, 8HJ, 8IJ, 8JQ, 8KG, 8LQ, 8ML, 8OE, 8OW, 8QK, 8RQ, 8SE, 8SP, 8TX, 8UE, 8UD, 8XE, 8YN, 8ZY, 8ZZ, 8ABN, 8ACF, 8AER, 8AGO, 8AHR, 8AIM, 8AJT, 8ALT, 8ANB, 8ASL, 8ASV, 8AVL, 8AWP, 8AXC, 8AXN, 8BAF, 8BDU, 8BDP, 8BHO, 8BJV, 8BJY, 8BOQ, 8BOZ, 8RPL, 8BRM, 8BTE, 8BXH, 8CAZ, 8CEI, 8CGP, 8CMM, 8CNC, 8CQX, 8CTP, 8CUM, 8CUR, 8DAK, 9IQ, 9OX, 9VZ, 9WC, 9ZN, 9AAH, 9AOT, 9APS, 9AWF, 9AWH, 9BEY, 9BHD, 9CAH, 9DCR, 9DFB, 9DPL, 9DWQ, (Can. 3BV).

3GC, Ardmore, Pa. (1 Tube)

C.W.: 1AGH, 1AJP, 1ANG, 1AOK, 1AYQ, 1AXB, 1AYZ, 1AZH, 1BAS, 1BBW, 1BKA, 1BLN, 1BOQ, 1BKQ, 1BRQ, 1BSJ, 1CEC, 1CGO, 1CJN, 1CMK, 1CN, 1CPN, 1GV, 1LL, 1QP, 1SD, 1UJ, 1XU, 1XX, 2AAB, 2ABZ, 2AF, 2AJA, 2ANM, 2APA, 2AVU, 2AYV, 2BB, 2BDM, 2BJP, 2BMS, 2BNZ, 2BQW, 2BRB, 2BUM, 2BUR, 2CBC, 2CBW, 2COD, 2CIM, 2CM, 2CMS, 2CPA, 2CQZ, 2FC, 2GR,

2HJ, 2KU, 2NZ, 2PX, 2UE, 2WB, 2XB, 2XC fone, 2ZK, 2ZL, 3ABX, 3AUW, 3BQ, 3MK, 3TJ, 3YO, 3ZO, 4BQ, 4DL, 4FT, 4FX, 4IU, 4LJ, 4EG, 5EK, 5ER, 5FV, 5MB, 5XA, 5ZAV, 6XAD, 6XE, 8AFD, 8AGO, 8AIM, 8AQO, 8ASV, 8AWP, 8CWA, 8AKN, 8BDO, 8BFH, 8BFM, 8BJH, 8BJX, 8BKA, 8BKU, 8BNO, 8BPL, 8BRM, 8CEI, 8CKG, 8CGN, 8CGX, 8CMI, 8CNF, 8CNW, 8CUE, 8CYT, 8DAK, 8HJ, 8LJ, 8KG, 8OW, 8QK, 8UV, 8VY, 8WL, 8YD, 8ZAE, 8ZW, 9AAU, 9AAF, 9AFE, 9AIU, 9AJH, 9AL, 9ANW, 9AOT, 9AON, 9APS, 9ARZ, 9BBF, 9BDF, 9BDS, 9BDQ, 9BIK, 9BLC, 9BNO, 9BRL, 9CBA, 9DAK, 9DQG, 9DKY, 9DW, 9DYN, 9DYW, 9EI, 9EJ, 9KP, 9OX, 9QR, 9SS, 9UD, 9XL, 9ZN L.C.W., 9ZW, Can. 9AW.

Spark: 20M, 8ZY.

3DH-3XM, Princeton Radio Club, N. J.

C.W.: 1AHZ, 1AIP, 1AR, 1AXB, 1ARY, 1AYQ, 1AZU, 1BCG, 1BDC, 1BEP, 1BKQ, 1BOQ, 1BUA, 1BQI, 1BUA, 1BWJ, 1CDZ, 1CGO, 1CJA, 1CMK, 1CNF, 1FB, 1FX, 1GV, 1JE, 1JT, 1LL, 1PR, 1QN, 1XM, 1XU, 1ZE, 2's and 3's too numerous, 4BX, 4CY, 4DL, 4DQ, 4FT, 4GH, 4GL, 4ID, 4NT, 4NV, 4PZ, 4ZAV, 5AAG, 5BN, 5DA, 5EK, 5ER, 5ES, 5FV, 5TJ, 5XK, 6XAD, 6HD, 6AB, 6ADN, 6AER, 6AEU, 6AFD, 6AGO, 6AGX, 6AGZ, 6AIG, 6AII, 6AIM, 6AJT, 6ALF, 6AMM, 6ANB, 6ANJ, 6APT, 6ARD, 6ASV, 6ASZ, 6AWT, 6AIC, 6AZO, 6BB, 6BCY, 6BDV, 6BEF, 6BFH, 6BGJ, 6BIM, 6BJX, 6BK, 6BLW, 6BLX, 6BMM, 6BNV, 6BOG, 6BPL, 6BUN, 6BUO, 6BUR, 6BVT, 6BWA, 6BXA, 6BJY, 6CAP, 6CBC, 6CBX, 6CEI, 6CEB, 6CF, 6CFP, 6CFX, 6CGB, 6CGJ, 6CGM, 6CGX, 6CJX, 6CJY, 6CKO, 6CNB, 6CNU, 6COL, 6COO, 6CTN, 6CTP, 6CTR, 6CUP, 6CWP, 6CXF, 6CZ, 6DAK, 6DB, 6EO, 6FM, 6FG, 6BV, 6HJ, 6JQ, 6JU, 6JX, 6KA, 6LM, 6LF, 6LT, 6ML, 6OW, 6OV, 6PJ, 6KQ, 6QO, 6SB, 6SP, 6SS, 6UE, 6UO, 6VY, 6XE, 6YD, 6ZAE, 6ZK, 6ZR, 6ZV, 6ZX, 6ZZ, 9AAP, 9AAU, 9AAV, 9ACS, 9AEF, 9AFB, 9AFK, 9AFN, 9AHH, 9AIP, 9AIY, 9AJF, 9ALC, 9ALP, 9ANQ, 9AON, 9AOT, 9APS, 9APW, 9ARG, 9ARZ, 9AUA, 9AVN, 9AWF, 9AWM, 9AXU, 9AYS, 9BCB, 9BCH, 9BCX, 9BDS, 9BED, 9BIB, 9BIE, 9BIF, 9BKV, 9BLY, 9BNO, 9BNU, 9BPD, 9BRS, 9BUE, 9BVP, 9BYA, 9BZI, 9CAH, 9CBA, 9CG, 9CH, 9CMS, 9CNU, 9CPC, 9CTR, 9CTX, 9DBV, 9DBZ, 9DCG, 9DFG, 9DHz, 9DQG, 9DKH, 9DKY, 9DRR, 9DVL, 9DWK, 9DYN, 9EI, 9GA, 9GK, 9II, 9IU, 9IY, 9KP, 9LZ, 9ME, 9OX, 9PI, 9SJ, 9UC, 9UU, 9WC, 9XAC, 9XL, 9YAJ, 9YAK, 9YF, 9YM, 9YU, 9YW, 9ZAA, 9ZN, Can. 3DH, 3NB.

3BLU, Haverford, Pa. (1 Tube) Every District C.W.: (1ABY), (1ANQ), (1AZD), (1BES), (1BYN), (1CJA), (2BGI), (2BSH), (2CFA), (2CNK), (3AJJ), (3TR), 4BQ, 4BX, 4DL, (4FE), (4FT), 4GL, 4NT, 5EK, 5EG, 5XA, 5XK, 5EN, 6KA, 6PI, 6XAD, 7AD, (8AQH), 8AWP, (8BFM), (8BUX), (8CBC), (8CPX), (8CUR), 9AAP, 9AIY, 9AOG, 9AOT, 9APW, 9ARZ, 9BED, (9CBA), 9DCG, (9DQG), 9EI, 9II, 9IO, 9UO, 9YAJ, 9ZN, Can. 3BV, 3DS.

Spark: 1BQ, 1CNI, 2AJE, 2OM, 3FP, 8BDA, 8TJ, 9ZN.

3ZH, 2300 S St., Washington, D. C.

("Antenna" Plug)

C.W.: 1GV, 1IL, 1RU, 1XP, 1XV, 1ZE, 1AGH, 1AGP, 1ASF, 1AYQ, 1BAS, 1BDI, 1BDQ, 1BKA, 1BKQ, 2GR, 2IG, 2ZK, 2AZC, 2BFX, 2BJO, 2BRD, 2CCD, 2CKL, 2COS, 3's too numerous, 4BB, 4EA, 4EK, 4JZ, 4NT, 5DA, 5DO, 5EG, 5EK, 5EO, 5ER, 5ES, 5FG, 5GA, 5HB, 5JB, 5KC, 5NK, 5PX, 5QY, 5SM, 5XA, 5XR, 5AAG, 5ACE, 5ADE, 6KA, 8's too numerous, 9CR, 9GN, 9HK, 9II, 9MU, 9PF, 9PN, 9PS, 9PW, 9UU, 9VZ, 9WC, 9YB, 9ZN, 9AAP, 9AFN, 9AHH, 9AHZ, 9AIP, 9AIY, 9AML, 9AMT, 9APS, 9AOU, 9ARG, 9AWM, 9AXU, 9BDS, 9BHD, 9BIK, 9BKP, 9BYF, 9BYZ, 9CBA, 9CCV, 9CGK, 9CLN, 9CNV, 9CPY, 9DJO, 9DOJ, 9DWM, 9XAC, 9ZAF, Can. 3CO, 3JI, 3SX, 9AL. All calls above logged on one night.

4OI, Mr. Luis Ruzach, Box 319, San Juan, Porto Rico (Detector and One Stop)

Spark: 4BC, 8BDA.

C.W.: 1IL, 1BCG, 1CQO, 2EL, 2HJ, 2TS, 2ZK, 2AGC, 2AWJ, 2BRB, 2CPD, 2CQZ, 3FS, 3AQR,

3BLJ, (4BX), (4BY), 4DL, (4EA), 4EB, 4EH, 4EL, (4FT), 4GH, 4GL, 4ID, 4NT, 5DA, 5ER, 5GB, 5KB, 5KC, 5NK, 5PJ, 5TJ, 5ACF, 5XAD, 5XAD, 7AD, 8OW, 8SB, 8SP, 8XE, 8MM, 8BDU, 9CC, 9KM, 9KP, 9LZ, 9PN, 9AAP, 9AJS, 9BJU, 9CCS, 9DSM.

4BL, Lakeland, Fla.

C.W.: 2FP, 2BY, 2WB, 2AER, 2AFB, 2AGC, 2CKL, 2CMS, 2CQZ, 3BL, 3CA, 3HW, 3IW, 3OT, 3QV, 3AFB, 3AJJ, 3BHM, 3BLJ, 3BMI, 3BVA, 3BVC, 3BWT, 3CER, 3CMS, 4AS, 4BB, 4BS, 4BX, 4BY, 4DL, 4EA, 4EB, 4EH, 4EL, 4FG, 4FT, 4GE, 4GL, 4GH, 4HW, 4ID, 4JY, 4JZ, 4KC, 4KI, 4LJ, 4NT, 4NV, 4OI, 4ON, 4OT, 5BQ, 5DA, 5DO, 5EB, 5EG, 5EK, 5EO, 5ER, 5FV, 5HL, 5JM, 5JW, 5KC, 5LB, 5MB, 5NV, 5QI, 5GS, 5SK, 5SM, 5VY, 5XA, 5XU, 5XY, 5XAD, 5XK, 5ZS, 5AAM, 5AAT, 5ABH, 5ACF, 5ZZ (1 tube), 8KG, 8KZ, 8OW, 8QK, 8SB, 8SP, 8ACE, 8AER, 8AET, 8APD, 8AIM, 8ANB, 8ASV, 8AWZ, 8AXB, 8AXC, 8BDO, 8BKE, 8BJF, 8BNO, 8BPL, 8BXH, 8CGM, 8CGE, 8CGX, 8CZC, 8XE, 9BS, 9EI, 9II, 9OK, 9AP, 9AKB, 9AMB, 9AMH, 9APS, 9ARZ, 9AWF, 9BJY, 9BLC, 9CGK, 9CLN, 9DWK, 9DYN, 9XAC, 9ZAA.

Spark: 2FP, 2ARY, 4BC, 4BW, 4BY, 5OI, 5XA, 8BDA, 9AZA.

4MY, Atlanta, Georgia (All Spark)

2FP, 2AJ, 2OM, 3BG, 3AWF, 3AOV, 5BW, 5DA, 5EK, 5EA, 5JX, (5FP), 5PX, (5QS), 5RZ, 5TM, (5TU), 5UE, 5UK, (5XA), (5XAC), 5ZQ, 6KA, 6XAD, 7BB, 8AEG, 8AIL, 8AIZ, 8AJB, 8ARD, 8AYM, (8BDA), 8BDV, 8BEP, 8BO, 8BVX, 8CO, 8CSD, 8EO, 8IRS, 8KJ, (8TJ), 8UC, 8VC, 8VY, 8XH, 8ZE, 8ZY, 9AAW, 9AMB, 9ABV, 9ACB, 9AFK, 9AHV, 9AMK, 9AOJ, (9AQE), 9ASA, 9AZE, 9AZF, 9BAL, 9BDD, 9BEF, 9BG, (9HO), 9BKK, 9BMN, (9BRT), 9BSM, 9BTX, 9BWS, 9CP, 9DCW, (9DGV), (9DHz), 9DKQ, (9DSD), 9DWM, 9DWX, 9DXK, 9DZY, 9HO, 9LF, (9OX), 9PD, 9PE, 9RR, 9UZ, 9ZN.

5KC, Plaquemine, La.

C.W.: (1BF), 1SW, (1AJP), (1CCZ), 2FP, (3BZ), (3CA), (3CC), 3HL, 3ALN, (3BLF), 3BVA, (3CXZ), (4AS), (4BF), (4BQ), 4BX, (4BY), (4DC), (4DL), 4EB, (4EH), (4EL), (4GH), 4HW, (4JY), (4KC), (4KF), 4LP, (4NT), (5AE), (5BA), (5BE), 5BM, (5BQ), (5CY), 5DI, (5DO), (5DY), 5DW, (5EK), 5ER, (5ES), 5EX, (5FV), (5HB), (5HL), (5IM), 5IR, (5IX), (5JB), 5JL, (5JM), 5JO, 5KP, 5KU, 5LA, (5LB), (5LJ), 5MA, (5MB), 5NK, 5NM, (5NV), (5PB), (5PX), 5QI, 5RH, (5RJ), (5SF), (5SK), (5SM), 5SZ, 5TU, 5UN, 5UO, 5VA, 5VI, (5VY), (5XV), (5XY), (5ZA), 5ZG, (5ZH), 5ZI, 5ZT, 5AAM, 5AAR, 5AAT, (5ABA), 5ACF, 5EOD, (5XAD), (5ZAG), 5EN, (6KA), 6XAD, (AD7), 7LU, 7ZU, (8AB), 8AM, 8BX, (8FT), 8IB, 8PT, (8SB), 8SE, (8SF), 8UC, 8UR, 8UZ, 8WR, 8XE, 8XJ, 8ZZ, 8ABV, (8ABZ), (8AFY), 8AIM, (8AJO), (8ALT), (8ANB), (8AQO), (8AQV), 8ASZ, 8AXB, 8BDB, 8BDU, (8BFM), 8BFX, (8BKE), 8BNU, 8BOX, 8BRQ, (8BVR), (8BWA), (8BXH), 8BXS, 8CDZ, (8CEI), (8CGX), 8CKO, 8CLD, (8CUR), (9CP), (9DR), (9EI), 9EJ, (9FK), (9FM), (9GK), (9II), 9IO, 9JA, (9KM), (9LQ), 9LR, (9NU), 9PA, 9PI, 9SO, (9UC), (9UU), (9XL), 9ZE, (9ZN), (9AAP), 9ABV, (9AJH), 9AJN, 9AMT, (9AOG), (9AON), (9AOU), (9APA), 9APF, (9APS), (9APW), (9ARG), 9ARR, (9ARZ), 9AUL, 9AUS, (9AWF), 9AXF, (9AYS), (9BCB), 9BCF, (9BDS), 9BED, (9BHD), (9BHI), (9BHM), (9BKP), (9BLG), (9BLO), 9BRL, (9BSG), (9BXT), 9BXW, (9BZI), (9CCS), (9CCV), (9CFI), 9CFT, (9CGK), (9CIE), (9CJA), (9CMK), 9CUI, (9CXK), (9DCF), (9DGE), (9DJQ), (9DKY), (9DPL), (9DSM), 9DJT, 9DTU, (9DUG), (9DWK), 9DXN, (9DYN), 9DZK, (9DZQ), 9DZY.

Spark: 4BI, 5BW, (5EA), 5HZ, 5MO, (5OI), 5QA, 5TU, 5UD, 5WU, (5XA), 5XAC, (5ZL), 5ADQ, 8YU, 8CDA, 9LF, (9OX), 9YB, (9AMK), (9AXU), 9AYW, (9DKY), 9DMJ, 9DMO, 9DQ, 9DZY, 9YAD.

5XA, Auburn, Ala.

Spark: (2AJ), (2FP), (2CCX), 3GN, (3AHK), (4BC), (4BI), (4EA), 4FD, 4FS, (4GN), (4HS), (4HX), (4MY), 5AO, 5AQ, (5BW), 5DA, (5DO),

(5EA), (5FI), (5FP), (5GD), (5GK), (5IS), (5JF), 5JL, 5LB, (5MO), (5MX), (5OI), (5OZ), (5PE), 5QL, (5QS), 5RG, (5RO), (5RZ), 5SO, (5TP), (5TU), (5UC), (5UD), (5UE), (5UK), (5YG), 5ZC, (5ZL), (5XAC), (5ZAW), 8TJ, (8UC), 8ZY, (8AFG), (8AIZ), 8ARS, (8AZF), (8BBU), (8BDA), (8BDV), (8BVX), 8CER, 8CYU, (8TVI), (9CP), (9IV), (9LF), (9MC), 9PD, (9PE), (9TV), (9YJ), 9YM, (9ZN), 9ABV, (9ACB), (9AFK), 9AFW, (9AHO), (9AMK), 9AOJ, 9AOT, (9AQE), 9AVH, (9AZA), (9AZE), (9AZF), 9BAH, (9BCX), 9BED, (9BKK), (9BMN), 9BRW, (9BVO), (9BWS), (9CTW), 9DAY, (9DCW), 9DDQ, (9DDZ), (9DHz), 9DJB, 9DQ, 9DRM, (9DS), 9DSN, 9DXM, 9DXT, 9DYV, (9DZY), (9XAC), 112 heard, 75 worked.

C.W.: (AQ-8), (AD-7), 1CJA, 2EL, (2FP), 2G, 2LO, 2NZ, 2OE, 2UD, 2WB, 2ZK, 2AGC, 2AWL, 2AYV, 2BFX, 2BRB, 2CCD, 2BG, 2BZ, 2FS, 2FY, 2HL, 2HX, 2IW, 2JH, 2OD, 2OT, 2PZ, 2QV, 2RF, 2TW, 2VW, 2ZW, 2AAV, (2AFB), 2AKK, 2ANZ, 2APR, 2ASP, 2AUU, 2BHM, 2BIJ, (2BSB), 2BVC, 2BVI, 2CCP, 2AS, 2BQ, (2BY), 2EG, 2DL, 2DQ, 2EA, 2EB, 2EL, (2EN), (2FG), (2FT), 2GN, 2GH, 2HW, 2ID, 2JK, 2JY, 2KC, 2KF, (2NT), 2KX, (2YA), 2AA, 2AK, (2BA), 2BW, (2BQ), 2CP, 2DA, (2DI), (2DO), (2EG), (2EK), 2EL, 2EO, (2ER), (2FV), 2GD, 2GK, (2HB), 2HL, 2IX, 2JP, 2JF, (2KC), 2MB, 2MX, 2MY, 2NK, 2NN, (2NU), (2NV), 2PB, 2PF, 2PV, (2PX), 2PZ, (2QI), 2QY, 2RB, (2RE), (2RH), (2SF), (2SK), (2SM), 2SR, 2TJ, 2TM, (2TP), 2TS, (2TU), (2UK), 2VM, (2XK), 2XR, (2XU), (2XV), 2ZA, 2ZH, (2ZG), 2ZU, 2AAD, (2AAM), (2AAT), 2ABH, (2ABY), 2ACF, (2ADE), (2XAD), (2XAE), 2ZAA, 2ZAG, 2ZAP, 2ZAS, 2AR, 2CU, 2CP, 2GF, 2GX, 2KA, 2PD, 2WXI, 2ZX, 2APX, 2BRG, 2BUN, 2XA, 2XR, (2AME), 2AN, (2BEO), (2CF), 2EO, 2IB, 2IQ, 2KS, 2ML, 2PD, (2CB), 2SP, 2UK, 2YN, 2XH, (2XE), 2ZZ, 2ABF, 2ABX, 2AGO, 2AFD, 2AFM, 2AME, 2AQO, 2ASV, (2AWZ), (2AXB), 2BCY, 2BEF, 2BEO, 2BFX, 2BHO, (2BKE), 2BKX, 2BNJ, 2BNU, 2BPL, 2BUX, 2BVR, 2BVT, 2BVX, 2CGH, 2CUR, 2DCY, 2DKE, 2DQU, 2STY, 2ZAF, 2ZAG, 2BU, 2CR, 2DP, 2EM, (2II), 2EL, 2KM, 2LF, 2LQ, 2LZ, 2MX, 2NY, 2OX, 2PI, 2TV, 2UU, 2XE, 2YM, (2ZN), 2AAU, 2AFT, 2AFK, (2AEO), 2AEP, (2AJH), 2AJP, 2ANO, 2ANQ, 2ANS, 2AMI, 2AOG, 2AON, 2APR, (2APS), 2AQH, 2AQU, (2ARK), 2ARR, 2ARZ, 2AUL, (2AVN), 2AWN, 2AWF, 2AWS, 2AXU, (2AYH), 2AYS, 2BCT, 2BCX, 2BDS, 2BEN, 2BEX, 2BGH, 2BHI, (2BIE), 2BIG, 2BIZ, 2BKE, 2BGZ, 2BJY, 2BJU, 2BLC, 2BNJ, (2BRK), 2BUD, (2BZI), 2CBA, (2CCS), 2CCV, 2CGK, 2CFI, 2CFX, 2CJA, 2CLN, 2CMK, 2CNV, 2CKP, 2DCR, 2DCU, 2DHB, 2DHz, 2DKY, 2DQ, 2DQV, 2DWK, (2DXN), (2DYN), 2DZY, 2HIZ, 2MEP, 2XAI, (2XAC), 2YAJ, 298 heard, 66 worked.

5RH, New Orleans, La. (All Districts)

C.W.: 1XU, 2EL, 2LO, 2NZ, 2ZK, 2AWF, 2BRB, 2AU, 2BG, 2BZ, 2KO, 2ZZ, 2AFB, 2BIJ, 2BLF, 2CXX, (2BY), 2DL, 2EB, (2EH), 2FG, (2FT), 2GH, (2HW), 2JZ, 2OK, 2ON, 2ZF, (2BA), 2DA, 2DO, 2EG, (2EK), 2ES, 2FV, 2HL, 2IR, 2JB, 2KC, 2KP, 2LO, 2LB, 2MB, (2NV), (2PV), 2PX, 2QI, 2RJ, 2SM, 2TJ, 2TP, (2UN), (2XA), 2XB, 2XD, 2XY, 2YG, (2ZH), 2ZY, 2AAM, (2ACF), (2XAD), 2KA, 2JD, 2ZI, 2ZZ, 2AVD, 2XAD, 2ZO, 2AB, 2AN, 2BO, 2CF, 2ER, 2IB, 2IQ, 2JQ, 2OW, 2QK, 2SP, 2UC, 2UE, 2VY, 2XE, 2YM, 2ZZ, 2ZK, 2ZX, (2AFY), 2AHA, 2AIM, 2ALT, 2ASL, (2ASV), 2BFM, 2BKE, 2BUC, 2BUT, 2BVR, 2BXH, (2BYN), 2CAZ, 2CBX, 2CKO, 2CGM, 2CGP, 2CUR, 2ZAG, 2AU, 2EI, 2EJ, 2EM, 2FM, 2II, 2KM, 2LZ, 2OX, 2PE, (2PQ), 2PS, 2UU, 2XL, 2YM, 2YU, 2ZN, (2AAP), 2AEP, 2AFD, 2AFK, 2AFW, 2AHH, (2AIX), 2AIY, 2AJH, 2AJP, 2AKB, 2ALW, 2AMI, (2ANQ), (2AOG), (2AON), (2AOU), 2APS, 2AQM, 2ARK, 2ARZ, (2ASD), (2AUA), 2AUL, 2AVN, 2AWM, 2AWS, 2AXU, 2BBF, 2BCB, 2BCF, (2BDS), 2BED, 2BGH, (2BIE), 2BIK, 2BJV, 2BKP, 2BLC, (2BLG), 2BMN, 2BQW, 2BRL, 2BRS, 2BSG, 2BXY, 2BZZ, (2CCS), (2CCV), 2CFI, 2CGH, 2CGK, 2CHN, 2CJA, (2CTE), 2CUC, 2CVW, 2CXF, (2DCR), (2DFB), 2DGE, 2DHR, 2DJM, 2DKY, (2DOF), 2DOK, 2DPL, 2DSM, 2DTJ, 2DWK, 2DXD, 2DXN, (2DYN), 2DZY, 2XAC, 2XQA, (2YAJ), 2ZAA, 2ZAF, Canadian 2CO, 2DH.

Spark: 2TU, (5XA), (5XAC), (5ZL), 2UC, 2YU, 2ZY, 2BEP, 2BDA, 2KI, 2OR, 2OX, 2AUR, 2AZA, 2CTW, (2DMJ), 2DS, 2DZY.

5DI, 2209 Azle Ave., Ft. Worth, Tex.

C.W.: 1BC, 1KU, 1AI, 1BRQ, 1CMK, 1DQE, 2EL, 2GR, 2LO, 2NZ, 2QK, 2XQ, 2ZK, 2ZL, 2AFP, 2AGC, 2AWZ, 2BMR, 2CCK, 2BZ, 2CO, 2DO, 2HL, 2IL, 2KL, (2QV), 2ZO, 2ZW, 2AAV, 2AFB, 2BIJ, 2BLF, 2BRJ, 2BX, 2DC, 2DG, 2DL, (2EB on tone), 2EH, 2FG, 2FT, 2GH, 2GL, 2GS, 2HW, 2ID, 2KI, 2KM, 2NG, 2NT, 2UU, 2AE, 2DO, 2EG, (2FV), (2HB), (2JB), 2JI, 2KC, 2NK, (2PV), (2PB), (2QS), (2XA), 2XU, (2ABH), 2ACF, (2AEC), 2XAD, 2AK, 2CC, 2CP, (2CU), 2EN, 2GF, 2GR, 2GX, (2JD), 2KA, 2PI, 2QG, 2RB, 2XJ, 2ZG, 2ZI, 2AAT, 2ABX, 2AJH, 2ANB, (2ARB), 2ARF, (2ASJ), 2AUU, (2AVD), 2AVR, (2AWP), (2AWT), 2BAD, 2BBC, (2BES), 2BJY, 2BKO, 2BOI, 2BQ, 2BQP, (2BSA), 2BUN, 2BZC, 2XAD, 2ZAC, (2AD), 2LU, (2LR), (2TC), 2ZO, 2ZV, 2ZU, 2AFY, (2AB), 2AF, 2AN, 2BK, 2BO, (2IB), 2KG, 2QI, 2QK, (2SB), 2SP, (2UR), 2UK, (2VY), (2WR), 2YD, 2YN, 2YU, (2ZE), 2ZX, (2ZZ), 2ABV, 2AIM, 2AME, 2AMT, 2ANB, 2ANN, 2ANX, 2AOI, (2AWZ), 2AXB, (2BCY), 2BDO, 2BEF, 2BFH, (2BFM), (2BKE), 2BNJ, 2BOE, 2BTL, 2BWA, 2BXF, 2BXH, 2BXT, 2BYT, 2BZY, 2CAG, 2CAK, (2CBC), 2CEP, 2CGY, (2CKO), 2CMI, 2CQC, (2CQX), 2CTP, 2CUR, 2CWU, (2CYT), 2DAK, 2ZAF, 2ZAG, 2BH, 2BI, (2CP), 2EX, 2FM, 2GL, 2II, 2KM, 2NN, 2OX, 2UU, 2VK, 2XL, (2ZN), 2AAV, 2ABV, 2AFN, 2AIU, (2AJF), 2AMB, 2AMI, 2ANQ, (2ANS), (2AOG), (2AON), 2API, 2AQM, 2AQR, 2ARZ, 2AUL, 2AVZ, (2AWM), 2AYS, (2BCF), 2BDI, 2BDS, (2BED), 2BES, 2BEY, 2BGH, 2BHY, (2BIE), 2BIF, 2BJC, 2BJI, (2BJV), (2BKK), 2BRO, 2BSN, (2BSZ), (2BTA), (2BTT), 2BVP, 2BXT, 2BZI, 2BZZ, 2CBC, 2CCR, 2CCS, (2CFI), 2CFW, 2CFY, 2CKM, 2CKP, 2CNS, 2CTR, 2CVO, 2CXF, 2DAH, 2DCR, 2DCY, 2DGK, 2DHB, 2DKI, 2DKY, 2DLK, 2DQE, 2DSA, 2DSM, (2DSL), 2DYN, (2XAI), CY-1; Canadians, (2BQ), 2CO, 2NB, 2QK, 2BV, 2NN, 2AL.

6AMT, Box 1594, Tucson, Ariz.

C.W.: 1GV, 1YK, 1BCG, 1BEP, 1BKA, 1BKQ, 1CNF, 2EL, 2FP, 2GF, 2GR, 2HW, 2LO, 2NZ, 2OE, 2AGC, 2AWF, 2AWL, 2AYV, 2BGM, 2BJO, 2BMR, 2BRB, 2BRC, 2CCD, 2CKL, 2CQZ, 2XAF, 2BA, 2BZ, 2CC, 2CG, 2FS, 2LP, 2LR, 2QV, 2ZW, 2ZZ, 2AFB, 2ARY, 2AUU, 2BGT, 2BHL, 2BIJ, 2BNU, 2BSB, 2BUV, 2BVA, 2BWT, 2BB, 2BX, 2DQ, 2EB, 2FG, 2FT, 2GH, 2ID, 2IL, 2JK, 2JY, 2NT, 2BW, 2CY, 2EG, 2FA, 2IX, 2JY, 2JM, 2KC, 2LB, 2NK, 2NN, 2NV, 2PO, 2PX, 2QI, 2QS, 2RJ, 2SF, 2SK, 2SM, 2TC, 2TJ, 2TM, 2TP, 2UJ, 2VA, 2VM, 2VO, 2VY, 2XV, 2XY, 2ZC, 2ZH, 2ZO, 2ZAW, 2AEC, 2ACF, 2AFQ, 2CC, 2CP, 2EC, 2GF, 2GX, 2KA, 2KE, 2KU, 2NX, 2RR, 2RR, 2ZL, 2ZZ, 2AAK, 2AHP, 2AJH, 2ALD, 2AMQ, 2APW, 2AQW, 2BGP, 2BIC, 2BIQ, 2BJR, 2BMX, 2BOD, 2BQP, 2BUD, 2BUM, 2BVG, 2BVL, 2BJ, 2BK, 2IY, 2LU, 2OT, 2TH, 2TT, 2AEM, 2CF, 2IB, 2KG, 2PD, 2QK, 2UK, 2XE, 2XH, 2YD, 2ZG, 2ZU, 2ZX, 2ZZ, 2ZAF, 2ZAG, 2AEM, 2AGO, 2AMM, 2APY, 2AQO, 2AWF, 2AXN, 2BEO, 2BMH, 2BNJ, 2BPL, 2CAY, 2CAZ, 2CPX, 2CQ, 2EW, 2FM, 2GK, 2JG, 2KM, 2NU, 2QF, 2ABV, 2ACI, 2AJH, 2AJP, 2AKD, 2ANQ, 2AOG, 2AON, 2APS, 2AQM, 2AQR, 2ARZ, 2AUL, 2AVM, 2AWF, 2AWS, 2AYS, 2BCF, 2BEY, 2BGH, 2BHI, 2BJI, 2BJK, 2BJV, 2BRI, 2BRK, 2BSZ, 2BTT, 2BUN, 2BVO, 2BXA, 2BXQ, 2CCS, 2CFI, 2CFY, 2CGK, 2CKM, 2CMK, 2CVP, 2DJB, 2DOF, 2DPL, 2DSM, 2DTM, 2DXN, 2XAC, 2XQA, 2YAJ, 2YAS, 2ZAA, 2ZAF.

6AOW, Riverside, Calif.

C.W.: 1XM, 1YV, 1ARY, 1CYK, 2CC, 2FP, 2FS, 2LO, 2AHO, 2CPD, 2NL, 2SV, 2EB, 2BQ, 2AA, 2BK, 2EL, 2FA, 2HB, 2HK, 2KC, 2LB, 2NB, 2NK, 2NV, 2PX, 2SG, 2SK, 2SM, 2TJ, 2TO, 2UN, too many 6's, 2BJ, 2DU, 2GO, 2GS, 2JW, 2LU, 2NY, 2OE, 2OT, 2QD, 2RA, 2RI, 2RN, 2SC, 2SY, 2TC, 2TT, 2WM, 2WX, 2XC, 2ZB, 2ZK, 2ZO, 2ZU, 2AEB, 2AEM, 2AFV, 2AHV, 2AB, 2BK, 2CF, 2PF, 2QK, 2SP, 2E, 2VY, 2YD, 2ZK, 2ZZ, 2AFD, 2AIM, 2AQO, 2ASV, 2AXN, 2BFX, 2BGL, 2BLV, 2BNJ, 2BVR, 2BXA, 2BXH, 2BXS, 2BXT, 2CMI, 2CUR, 2DR, 2DF, 2EA, 2EI.

9FV, 9GK, 9II, 9KP, 9LQ, 9OX, 9PI, 9PN, 9PW, 9UU, 9WD, 9XL, 9YF, 9YH, 9YI, 9AAP, 9AAU, 9ABG, 9APK, 9AJS, 9AMB, 9AMI, 9AMM, 9AMN, 9ANI, 9ANQ, 9AOG, 9AON, 9APS, 9ARZ, 9AUL, 9AVZ, 9AWN, 9AWL, 9AWM, 9AXU, 9AYS, 9AZZ, 9BCG, 9BCL, 9BCQ, 9BED, 9BEF, 9BHD, 9BHK, 9BIK, 9BIZ, 9BJI, 9BJV, 9BQF, 9BRI, 9BUN, 9BVO, 9BXA, 9BXN, 9BXQ, 9BZD, 9BZI, 9CCS, 9CCV, 9CFI, 9CNS, 9COW, 9DBI, 9DCG, 9DGE, 9DKY, 9DQR, 9DSM, 9DTM, 9DYN, 9ZG, 9ZL, 9ZAA, 9ZAF, 9ZAX, 9XAU, 9YAJ, 9YAK.
Spark: 7OT, 7VF, 7VO, 7ZG, 7ZU, 7WG, 7AEA, 7ABH, 9ZN, 9YAH.

6ZY, Honolulu, Hawaii

C.W.: 4BQ, 4BX, 4EB, 5DI, 5JW, 5KC, 5KS, 5PX, 5ZH, 5ZA, 5AAT, 5ABX, 5ABU, 5AK, 5AEH, 5AOL, 5AWT, 5APW, 5AHQ, 5AJH, 5ASJ, 5AB, 5ABE, 5ALU, 5ATG, 5BXY, 5BRX, 5BR, 5BAR, 5BQC, 5BPZ, 5BLQ, 5BUN, 5BZC, 5BSA, 5BFE, 5CU, 5CP, 5CC, 5EN, 5EC, 5EA, 5EB, 5EX, 5GX, 5JD, 5KA, 5MBC, 5MDM, 5PI, 5XAD, 5XWI, 5ZH, 5ZX, 5ZM, 5ZE, 5ZS, 5ZQ, 5ZG, 7KJ, 7LU, 7MF, 7XC, 7ZO, 8AB, 8AH, 8ALT, 8ABR, 8BG, 8BFM, 8BPL, 8BSS, 8BDA, 8IB, 8KG, 8OH, 8OK, 8OW, 9AAP, 9AC, 9AJA, 9AWM, 9APH, 9ARZ, 9APS, 9AOG, 9ALT, 9AO, 9AMB, 9AGS, 9BBF, 9BNO, 9BBL, 9BEC, 9BED, 9BJV, 9BZI, 9CNS, 9CPB, 9DHB, 9DSM, 9DG, 9DPL, 9DG, 9DTM, 9DPH, 9PS, 9UU, 9ZAF, 9WUBA.

Spark: 6AHF, 6EN, 6UP, 6BJU, 6BFE, 7NN.

6ZAC, Wailuku, Maui, T. H.

C.W.: 2FP, 4BV (Canadian), 4BQ, 5ACF, 5NK, 5TJ, 5SF, 5PX, 5XAD, 5ZAW, 5ZH, 5ZA, 6AJH, 6AK, (6ASJ), 6AEH, 6AHQ, 6ASR, 6AVD, (6AQU), (6ABX), 6BPF, 6BPZ, 6BJU, 6BRC, (6BSA), 6BQC, 6BRF, 6BQD, (6CC), 6CU, 6EC, (6EN), (6EX), 6JD, (6KA), 6KU, 6PI, 6RD, 6RM, (6TQ), (6XJ), 6XAD, 6ZX, 6ZAF, 6ZM, 6ZB, 6ZF, (6ZG), (7SC), 7SY, (7OT), (7XJ), 7ZB, 8BUM, 8WR, 9AMB, 9AG, 9APH, (9AWM), 9AOG, 9BEY, 9BJI, 9DSM, 9GK, 9MF, 9XAX, 9YAJ, 9ZAF, 9ZX.

Spark: 5ZA, (6EX), (6AQU), 9YAK. (Alove calls heard Oct. 4th to 14th).

6BSQ, Box 1298, Nogales, Ariz.

(All Districts—Detector Only)

C.W.: 1ARY, 1BCE, 2AEC, 2BEM, 2CQE, 2ER, 2NZ, 2XAP, 3AAY, 3AFB, 3AUU, 3BJJ, 3BUY, 3BVA, 3BUV, 3JK, 3FS, 3OD, 3OT, 3QV, 3ZW, 4BX, 4BY, 4DC, 4DL, 4EB, 4FT, 4ID, 4NT, 5AEC, 5CY, 5DI, 5AAB, 5EL, 5FA, 5BA, 5FV, 5HK, 5IR, 5JL, 5JR, 5LB, 5LX, 5MJ, 5MY, 5NK, 5NB, 5NN, 5OI, 5PX, 5PU, 5FD, 5QS, 5QL, 5PB, 5RR, 5SK, 5SP, 5SM, 5SN, 5TM, 5TK, 5TP, 5TC, 5UN, 5UO, 5UJ, 5UY, 5VO, 5VU, 5VO, 5XY, 5XAD, 5XD, 5XK, 5ZA, 5ZH, 5ZAE, 5ZAV, 5ZS, 5ZM, 5ZU, 5ZAL, 5ZO, 5ZY, 5ZAD, 5ZES too numerous, 7AFW, 7BJ, 7BK, 7LU, 7SC, 7TQ, 7YA, 7ZE, 7ZU, 7ZV, 7ZO, 8AEN, 8ASV, 8AQO, 8AIO, 8AIM, 8AMM, 8APY, 8ALT, 8AEO, 8ADN, 8BXF, 8BKE, 8BPL, 8BXH, 8BDO, 8BLA, 8CEP, 8CF, 8CEX, 8DR, 8IB, 8QI, 8QK, 8WR, 8XL, 8XH, 8XE, 8XAE, 8ZAF, 8ZZ, 9ABV, 9AMB, 9AWN, 9AYS, 9AVZ, 9AQE, 9ARM, 9ABV, 9AAP, 9AJP, 9AOY, 9WM, 9AUL, 9APW, 9AXU, 9AEQ, 9AVZ, 9BXA, 9BFE, 9BXT, 9BJI, 9BUN, 9BXQ, 9BZE, 9BJV, 9BCF, 9BVO, 9BZZ, 9BRI, 9BEY, 9BLO, 9CCS, 9CJJ, 9CCI, 9CFY, 9CMK, 9DJJ, 9DTM, 9DTE, 9DXY, 9DTU, 9DPL, 9DWK, 9DKY, 9DSM, 9DET, 9FV, 9EK, 9PI, 9PS, 9XAB, 9XAU, 9XAY, 9XAC, 9XM, 9YAK, 9YW, 9YAH, 9YK, 9YM, 9ZAF, 9ZAS, 9ZAA, 9ZAC, 9ZV, Canadian 3CO, 9AL, 9AW, 9OF, 9AD, 9DN.

7AZ, Vancouver, Wash. (In 3 hours—Every Dist.)

C.W.: 1AW, 2CYS, 3CO, 4AMN, 4HH, 5HM, 5SE, 6ABX, 6ALU, 6ARK, 6CC, 6CU, 6RD, 6XAD, 6ZX, 7AFW, 7AIC, 7LU, 7ET, 7ZB, 7ZK, 8ASV, 8BCM, 8BZY, 8OW, 9AUL, 9AVZ, 9AVM, 9BJI, 9DWK, 9DP, 9GK, 9II, 9YAJ.

7IY, Vashon, Wash. (Beverage Wire)

C.W.: 1BEP, 1BKA, 1CY, 1KV, 1XU, 2AWL, 2CCP, 2EL, 2LO, 2NZ, 2UK, 3CGP, 3CO, 3DH, 3DS, 3JU, 3OI, 4BV, 4EH, 4FG, 4GH, 4KF, 5AAT, 5DI, 5DO, 5EK, 5FY, 5JM, 5KC, 5NK,

5NN, 5PB, 5PX, 5QI, 5SF, 5SG, 5SK, 5SM, 5TJ, 5TM, 5UK, 5UO, 5VM, 5XAD, 5XK, 5ZA, 5ZH, 5ZO, 5AGO, 5AMM, 5APT, 5AQO, 5APY, 5ASV, 5ATU, 5AXB, 5BCY, 5BEF, 5BFM, 5BNJ, 5BK, 5BXH, 5BYT, 5CAY, 5CF, 5CFZ, 5CGX, 5CHC, 5CMI, 5CP, 5CYT, 5FD, 5HZY, 5IB, 5JU, 5OW, 5PD, 5QK, 5SP, 5XAE, 5ZAG, 5ZF, 5ZZ, 5ZV, 9AAK, 9AAP, 9JP, 9AMB, 9AMI, 9AMK, 9ANQ, 9AON, 9AOP, 9APW, 9AQE, 9ARZ, 9AUL, 9AVM, 9AVS, 9AVZ, 9AWR, 9AWM, 9AZA, 9AYZ, 9BAY, 9BB, 9BCF, 9BED, 9BFG, 9BGH, 9BHD, 9BHQ, 9BIE, 9BJI, 9BRI, 9BSN, 9BUN, 9CCV, 9CFI, 9CFV, 9CFY, 9CNS, 9COW, 9CTW, 9CUC, 9DAG, 9DCU, 9DKV, 9DNK, 9DSM, 9DSD, 9DTM, 9DYN, 9GK, 9II, 9LZ, 9PI, 9QF, 9UU, 9XAC, 9YAJ, 9ZAF, 9ZH, 9ZK, 9ZY.

8NB, Rochester, N. Y. (All Districts)

Spark: 1AW, 1CK, 1AKC, 1BDT, 1BOQ, 1CJA, 1CNI, 2RY, (2OM), 2SQ, 2WB, 2AJE, 2CCX, 3HJ, 3SF, 3ACY, 3AIC, 5XA, (8FE), (8KJ), 8TJ, 8UC, 8VQ, 8VW, 8YU, 8ZY, 8ABL, 8AFG, 8AVI, 8AWU, (8AXQ), 8AZF, 8AZW, 8BAH, 8BDA, 8BRL, 8BVB, 8BXC, (8BZH), 8CAH, 8CER, 8CKX, 9CP, 9JX, 9KF, 9ZN, 9AMK, 9AVP, 9AZE, 9BEF, (9BMN), 9BWS, 9DHW, 9DXT, Can. 3FO.

C.W.: (1AW), 1CN, (1ES), 1GV, 1HK, (1II), (1IL), (1IV), 1IX, 1KK, 1LL, (1ON), 1QP, (1RI), 1SD, 1TS, 1UJ, (1VC), 1XM, 1XU, (1YK), 1ZE, 1AGH, (1AJU), 1AKG, 1ANQ, 1AOK, 1AQL, 1ARY, 1AWB, (1AYZ), 1AZD, (1AZL), 1BAS, 1BCF, 1BCG, 1BDC, 1BDI, (1BES), 1BGF, (1BJN), 1BKA, 1BKG, (1BQ), 1BQD, 1BQI, 1BQK, 1BRQ, 1BSC, 1BSJ, 1BVR, (1BWJ), (1BYN), 1CAC, (1CMK), 1CMS, 1CNF, 1CPN, 2DR, 2EL, (2FC), 2FD, 2GF, 2GR, 2HJ, 2HL, (2HW), 2KE, (2KU), 2LO, (2NZ), (2RY), 2RZ, 2UD, 2XQ, 2ZL, (2ZS), 2AAT, (2ABZ), 2AEH, 2AFP, 2AGB, 2AGC, 2AGS, 2AIO, 2AJA, (2ANM), (2AQH), 2AUU, (2AUZ), 2AVE, 2AVU, 2AWL, 2AWS, 2AYV, (2BBB), 2BBG, (2BGI), (2BJO), 2BLS, 2BNC, 2BML, 2BQD, 2BRB, 2BRC, 2BUE, (2BUM), (2BWA), 2BYC, 2CBF, 2CCD, (2CBW), (2CD), 2CGJ, 2CGV, 2CKL, (2CKN), 2CLT, (2CMS), 2COL, 2CQZ, 3AC, 3BA, 3BG, 3BZ, 3CA, (3CG), 3HG, (3IW), 3JH, 3MB, (3OE), (3OT), (3QV), (3SZ), 3VU, 3VW, (3YO), (3ZO), 3ZZ, 3ADE, 3AFB, 3AJB, 3AJD, (3AJO), (3ANJ), 3APR, 3AQR, (3ATG), 3AUU, 3AUW, 3AVA, 3AVC, (3AWA), 3BHL, 3BHM, 3BIJ, 3BIT, 3BLF, 3BLU, 3BJY, 3BML, (3BNU), 3BOF, 3BRC, 3BRW, 3BTY, (3BUV), 3BVA, (3BVC), 3BVL, 4LX, 4EA, 4EL, 4EN, 4GN, 4HW, 4IJ, 4JM, 4JY, 4LJ, 4NT, (4YK), 5BR, 5DI, 5DO, 5EK, (5ER), 5FV, 5HB, 5HL, 5KC, 5PV, 5PX, 5RH, 5SK, 5TJ, 5ADE, 6KA, (6XAD), 7ADJ, 8's and 9's to numerous, (AD-7), WAR, WUBA, Canuck: (2AM), (3AT), (AD-7), WAR, WUBA, Canuck: (2AM), (3AT), (3BP), (3CO), (3DE), 3DH, (3JE), (3JI), (3JK), 3MY, 9AL, 9AW, 9BS.

8BFM, Akron, O. (Worked)

1AGH, 1BAS, 1BKQ, 1FB, 1XP, 1YK, 2AUZ, 2AWO, 2BBR, 2BQD, 2BRB, 2BUE, 2NZ, 2VA, 2ZK, 3AIS, 3BLU, 3BNU, 3CUR, 3FS, 3PZ, 3QV, 4BX, 4FO, 4GH, 4KC, 4NT, 4NV, 5DI, 5EK, 5EO, 5KC, 5NV, 5PX, 5TJ, 5ZAV, 6AWT, 6KA, 6XAD, (6BOE, 6CP, 6JD, heard only), 7ZO (7XC, heard only), 9ALW, 9AMB, 9AOG, 9APS, 9AQM, 9AYS, 9BFM, 9CJA, 9DEK, 9DKY, 9DR, 9DVW, 9DZB, 9DZZ, 9II, 9IO, 9OF, 9OX, 9UU, 9VZ. All C.W. of course.

8BMM, Olean, N. Y. (1 tube)

C.W.: 1AYQ, 1BAS, 1PRQ, (1CMK), (1CNF), (1CPN), 1SL, 1XM, 2AAB, (2AUZ), (2AVE), (2AWS), (2BGI), (2BNC), 2BRB, (2BUE), (2BWA), (2BYC), (2CBW), 2FZ, 2GK, 2HJ, 2JW, 2RZ, 2WB, 2ZK, (3AAO), (3AFB), (3AJD), 3ANJ, (3APR), (3BFC), 3BHL, (3BHM), (3BNU), 3BOF, (3CFB), (3BB), 3DG, (3CC), 3FS, 3LR, (3OT), (3PX), (3RE), 3QV, (3VW), (3YO), 3ZO, 3ZW, 4BQ, 4BX, 4DC, 4EB, 4FQ, 4GH, 4GS, 4ID, 4LJ, 4LP, 5AAM, 5BA, 5DA, 5DO, 5EK, 5FV, 5KC, 5NT, 5NV, 5PV, 5PX, 5QI, 5SK, 5SU, 5UJ, 5ZA, 5ZAG, 6BUN, 6XAD, 6EN, 6GX, 6KA, 7AN, 7LA, (8A), (8R), (8AME), (8AMM), (8ASL), (8AXN), (8BCL), (8BKO), (8BLT), (8BJC), (8BJV), (8BI), (8BNH), (8BQB), (8BTR), (8BWA), (8CAK), (8CBC), (8CCS), (8CIX), (8CKO), (8CON), (8BO), (8HJ), (8KG), (8NB), (8QB), (8UE), (8YN).

A Few Minutes at 6ZAC

How would you like to be located on a far away island in the Pacific Ocean and hear amateurs from all parts of the U.S.? Oh boy! Take a look at the list below, extracted from 6ZAC's log during some lively minutes, and then look on a map and figure the distance! Over the ocean, Rockies, prairies, 'n everything! Think of the things we considered great just a short while ago! But now look over the list, received just as the last few pages of this issue were going on the press. Many of the owners of the calls are unknown to

6ZAC so this will be good news to many and we therefore have made special effort to squeeze this in. The time given is 2½ hours later than Pacific Standard and all reception was done with one step of audio amplification.

Now what do you think of that? Dow, O.M., we don't believe there is a single honest-to-goodness amateur in this country but what would give his best detector tube to sit in with you five minutes! FB OM, FB!

October 26th, 1922

7:15 P.M.	Test de 9ZN	I.C.W.	200 meters	QSA	
7:19 "	" " 9BJI	C.W.	" "	"	
7:19 "	" " 9BBF	"	" "	"	
7:20 "	" " 9CNS	"	" "	"	
7:20 "	" " 9AMI	"	" "	"	
7:21 "	" " 9AWM	"	" "	"	
7:22 "	" " 9BEY	"	" "	"	
7:23 "	" " 9DYN	"	" "	"	Just signing off.
7:24 "	" " 9CCV	"	" "	"	
7:26 "	" " 9BEY	"	" "	"	Calling CQ also.
7:26 "	" " 9DSP	"	" "	"	
7:30 "	" " 9AWT	"	" "	"	"QRA Duncan, 196 Ellsworth Ave., Toronto, Canada"

October 28th

6:37 P.M.	Test de 8AMM	C.W.	200 meters	QSA	
6:38 "	" " 8XH	I.C.W.	" "	"	
6:39 "	" " 9DTM	A.C.C.W.	" "	"	
6:40 "	" " 9APY	C.W.	" "	"	
6:40 "	" " 8BEF	"	" "	"	
6:41 "	" " 9AMB	"	" "	"	
6:41 "	" " 9AXM	A.C.C.W.	" "	"	
6:41 "	" " 9ZAF	C.W.	" "	"	
6:42 "	" " 9BJI	"	" "	"	
6:43 "	" " 5KC	A.C.C.W.	" "	"	
6:43 "	" " 9ZX	C.W.	" "	"	
6:43 "	" " 9GK	"	" "	"	
6:44 "	" " 9BCH	A.C.C.W.	" "	"	QRZ
6:45 "	" " 9BRI	"	" "	"	
6:46 "	" " 9CCV	C.W.	" "	"	QSA
6:47 "	" " 9AVZ	A.C.C.W.	250	"	
6:52 "	" " 9YAJ	C.W.	200	"	
6:53 "	" " 9XL	A.C.C.W.	" "	"	
6:54 "	" " 9PI	C.W.	" "	"	"6½ amps"
7:03 "	" " 9AW	"	" "	"	

October 29th

6:23 P.M.	Test de 8AWP	I.C.W.	200 meters	QSA	
6:23 "	" " 8XH	"	" "	"	
6:25 "	" " 9ZAF	C.W.	" "	"	
6:27 "	" " 9BJI	"	" "	"	
6:27 "	" " 9BDS	"	" "	"	"QRA Cape Girardeau, Mo."
6:27 "	" " 9CNS	"	" "	"	
6:28 "	" " 9PI	"	" "	"	
6:29 "	" " 9ARZ	"	" "	"	
6:30 "	" " 9YAJ	"	" "	"	
6:33 "	" " 9CFY	"	" "	"	
7:09 "	" " 1BCG	"	" "	"	"QSL cards Greenwich, Ct."
7:11 "	" " 2NZ	"	" "	"	
7:12 "	" " 2NZ	I.C.W.	" "	"	
7:13 "	" " 2GR	A.C.C.W.	" "	"	
7:14 "	" " 2AGC	C.W.	" "	"	
7:15 "	" " 2XAP	"	" "	"	
7:16 "	" " 2BFX	"	" "	"	

(Concluded from page 88)

5AAT, 5ABN, 5XK, 5AD, 6CP, 6CU, 6CC, 6EN, 6GR, 6JD, 6KA, 6RM, 6ABX, 6ATG, 6AVD, 6AWT, 6BUM, 6BUN, 6XAD, 6ZI, 6ZZ, 7BB, 7LU, 7MS, 7SC, 7TH, 7AFW, 7ZO, 7ZU, loads of 8's and 9's Canadian C.W.: 2BG, 3CO, 3GN, 3DH, 3JJ, 3KO, 3JK, 3DS, 4BV, 3XN(?) 9AL, 9AW, 9AW, Specials: CYI, AD7, NOF. Copied every district for five consecutive night during Prelims.

9WM, Sleepy Eye, Minn.

Spark: 5PE, (5U), 5XA, (5XAC), 7ZU, 8ZY, C.W.: (1FB), 1GV, (1XM), 1XU, 1YK, 1AGH, 1RY, 1BCG, 1BEP, 1BKQ, 1BJN, 1BRQ, 1CMK, 1COL, 2EL, 2FD, 2FP, 2GR, 2HJ, (2HW), 2LO, 2NZ, (2RM), 2WB, 2XQ, 2ZK, 2ZL, 2AEV, 2AHO, 2AGC, 2AWF, (2AWL), 2AZO, 2BEA, 2BFX, 2BML, 2BMR, 2BQU, (2BRB), 2BRC, 2CAF, 2CCD, 2CKL, 2CQZ, 3BG, 3BZ, 3CC, 3FS, 3HL, 3JJ, 3LP, 3PQ, 3SK, 3TC, 3TJ, 3ZO, 3ZW, 3ZZ, 3AAY, 3APB, 3ALN, 3ANJ, (3APR), 3AQH, 3ASP, 3BFQ, 3BLJ, 3BIY, 3BLF, (3BNU), 4AS, 4BB, 4BQ, (4BX), 4BY, 4CR, 4CY, 4DC, 4DQ, 4EH, 4FG, 4FT, 4GH, 4HW, 4ID, (4KF), 4KL, 4LJ, 4MH, 4XD, 4BE, 5CY, (5DI), 5DO, 5EG, (5EK), 5EL, 5ER, 5FV, (5HB), 5HL, 5IR, 5IX, 5JB, (5JL), 5KB, 5KC, (5LB), 5MB, 5MY, 5NN, 5NK, (5NV), 5QI, 5PB, 5PF, (5PX), 5OI, (5SF), (5SM), 5SK, 5XK, (5XV), 5ZA, (5ZH), 5ZM, 5AAM, 5AAG, 5ABY, (5ACF), 5XAD, (5ZAW), 5ZAV, 5ZAZ, (6CP), 6CC, 6CU, (6GX), 6JD, (6KA), 6LK, 6PI, 6TI, (6VM), 6XT, 6ZF, 6ZG, 6AJH, (6ALU), (6ASJ), 6AWT, (6BES), 6BNW, (6BOE), (6XAD), (6ZAC), (7EX), 7IF, (7LU), 7SC, 7ZB, 7ZO, (7ZU), 7AFW, 8AB, 8AN, 8AX, 8CF, 8DR, 8FH, 8FT, 8HH, 8HJ, 8GT, 8IB, 8IJ, 8JU, (8KG), 8KN, 8ML, (8PT), (8QK), 8SB, 8SF, (8SS), (8TT), 8UE, 8UK, 8UZ, (8VY), 8XE, (8YD), 8YG, 8YN, 8ZE, 8ZW, 8ZX, 8ZY, 8ZZ, 8ACH, 8ACO, 8AFD, (8AGR), 8AIM, 8AIO, 8ALF, 8ALU, 8AME, 8ANB, 8APY, 8AQO, 8ARD, (8ATU), (8AWP), 8AWZ, 8AXB, 8BBR, 8BCY, 8BDV, 8BEF, 8BEK, 8BFH, (8BFX), (8BGO), 8BGL, 8BHO, 8BJC, 8BJV, (8BJX), 8BKE, 8BKH, 8BLV, (8BLV), 8BOZ, 8BPL, 8BRM, (8BTL), (8BUC), 8BUX, 8BWZ, 8BXA, (8BXH), 8BXT, 8BXK, 8BYF, 8BYS, 8BZY, (8CAU), (8CAZ), 8CBX, 8CCM, 8CDG, (8CE?), 8CEZ, 8CGP, 8CGX, (8CIX), 8CMI, 8CMH, (8CP), (8CPT), 8CPX, 8CTP, (8CUR), 8CYE, (8CYT), 8CZC, 8CZO, 8DAK, 8ZAE, 8ZAF, 8ZAG, Canadians: 3BP, 3BV, 3CO, 3DS, 3GK, 3GN, 3KO, 3NB, (4BR), (3BV), 4GB, (4HH), (9AC), 9AL, 9AW. 9's too numerous to mention.

SOS A LA WIRELESS WILLIE

(Concluded from page 80)

glowed. We gravitated toward him and he unfolded the plot that was to raise a laugh and drive away the blues. "I want one of you to help me," he said. We tossed a coin, and the lot fell to Tommy Lay.

Now the victim of this conspiracy was a pink cheeked rural youth, who had left his country school appointment at England's call and was now a "learner" in the W/T classes on "Niobe." A credulous sort of chap he was, who was forever being sent up forward to see if the bos'n had pressed Willie's pants yet, or down below to see if the gadget was ready for Mr. Emerson, or up to the officer-of-the-day to ask if he might go ashore at four bells!—a lad who never once failed to fall for some fool's errand, ever a ready target for a sailor's joke.

On this particular night Gulsen was "sitting in" for practice and laboriously spelling out the press from POZ. Lay opened the door of the coop and stood be-

hind his victim, while Wireless Willie carefully disconnected a wire from the test buzzer outside in the transmitter cage.

"How's everything?" asked Lay suddenly.

Gulsen jumped—"Oh just a lot of rot from POZ. That Fritz guy makes me sick."

"Switch her down on Q and listen for some real stuff, why don't ye?"

"Guess I will."

As the set was tuned over to 600 meter adjustments, WCY's wailing note came in. Gulsen immediately began to murder A3Y's code message. This was Willie's chance. Carefully bracing his elbow on a nearby jigger-box he slowly ticked off his message on the buzzer. Gulsen, with true learner's instinct, deserted A3Y for the louder signal. "EEE TTT EEE" he wrote, straining and grunting with the supreme mental effort necessary at his stage of advancement. "EEE TTT EEE S S Stanleysink." Lay removed his right hand from the button to stifle his rising mirth. The sigs stopped, and he hastily placed the hand back on the button and used the other. "52436834 NW immediate assistance" wrote the victim. The sigs stopped again, and there was a deadly calm. "Wat's 'EEE TTT EEE' stand for?" asked Gulsen.

"Dunno," said Lay in a strained voice, "must have got it down wrong. Wat's that 'assistance' stuff at the end—looks like it might be a distress call!"

"That's it!" cried Gulsen, his face suddenly white and his body a quiver, "'EEE TTT EEE' should be SOS!"

"Sure enough," said Lay calmly, "that's what it is—should 'ave noticed that."

"What'll we do about it?" whispered the ashen goat, in an awed voice. "Better take it to the O.W.," advised his tempter.

Gulsen rushed down to the officer of the watch and showed him the message.

Now if Wireless Willie had stopped the proceedings here nothing more would have happened, but Willie lost his nerve after this unlooked-for development and beat it off for the mess room along with his fellow conspirator, where together they sat staring at one another in fearsome apprehension. Meanwhile things happened.

The O. W., not being "in" on the conspiracy, promptly turned the thing in to the N.I.D. office. Now the Naval Intelligence Department had no fools. The officer on duty looked at the msg. and then at Gulsen's white face; he knew men, and though appearances were against it, he "smelled a rat." True, "Stanley" was out near Sable Island somewhere, but—well, it looked queer—this SOS on a clear night of calm seas. He opened the wire and called Camperdown, but he hadn't heard it. The grim man smiled under his brass hat, and turned to answer the bridge phone. "Rush visual from 'Highflyer,' sir," said the signalman on the bridge, "intercepted W/T,

prefix p, begins, SS Stanley sink (break) 52436834 N.W. mined immediate assistance ends signals weak and broken—Hall."

The three-ringer lost no time. He dismissed his audience with curt nod and set about the execution of his duties. Two ships were near the position given, but both were bound in to Louisburg for fuel; they could not be diverted. There was nothing to do but send out ships from the base. PV's 4, 5, and 6, and drifters CD 37, 42, 56 and 67 were ordered to follow "Grilse" to the scene of the sinking and report every hour via W/T. The little destroyer was off and out of sight before the first PV had steam up, but one by one they followed out past St. Georges Island, and on thru the defenses, into the night.

Gulsen walked on air from the N.I.D. to the gunroom mess; with head erect and bulging chest he related the receipt of the confirming message from "Highflyer," who lay in Berth about a hundred yards from "Niobe" but out in the stream. Wireless Willie jumped to his feet. "Wha-a-a-t!!," he cried, "you say 'Highflyer' got that too?" His outspread hands, open mouth and staring eyes were reflected upon the person of his fellow in crime.

Gulsen began to see the light. "W-what's all about it" he said, "you seem to think something's wrong by the look of you."

"Everything's wrong," said Lay, who felt not the same sense of responsibility that had now frightened Wireless Willie into silence. We were only jokin' about that SOS wireless here. Sent it to you on the 'bee' to fool you."

Gulsen's jaw dropped. After a long silence the three tiptoed together, aft along the passage toward the torpedo chamber (which was now used as a dressing room) in search of sympathetic ears among their mates.

I was in Cabin 12 chatting with a friend whom I had not seen for some time. The door opened and in walked the three crepe-hung actors. The case was explained in many words, advice and council were solicited. My friend was inclined to treat it as a good joke on old Brass Hat and pass it over. But my own sense of humor is subject to limitations and I saw nothing funny in the affair. The buzzer signals had evidently radiated sufficiently to be picked up a scant 400 feet away by "Highflyer's" sensitive audions. By reason of time and tide, she lay but a short way from us with her aerials paralleling ours. I advised the criminals to confess and have the search vessels turned back before they should have needlessly burned up more of His Majesty's coal and oil.

There was really nothing else they could do. So they confessed. And I went back to the comfort of our own wardroom.

Wireless Willie was put in irons and left to dream of sunrise and a firing squad for

two whole days; for the same two long weary days Tommy Lay picked oakum in the fore, and Gulsen stayed aboard, guest of the O.M. The courtmartial had to wait until four captains should be at hand. At length "Devonshire" and "Achilles" steamed in, and the four brass hats got together. I imagine the court martial must have been funny, for though the offense was really very grave, it had its humorous side.

Anyway, the final outcome was that Wireless Willie got a lecture on "an officer's wartime duty to H.M. the King," and lost all his seniority; Lay got a similar, if somewhat lesser punishment; and Gulsen was advised to change his name—in hopes it would make him the less gul-ible in the future. —!

LETTERS FROM FRANCE

(Concluded from page 74)

tion would then pay in addition to 100 francs, 24,000 francs a year—if its antenna is not more than 50 meters high. If it is higher than 50 meters, it will pay 48,000 francs a year, and if it is higher than 100 meters, 72,000 francs a year, but!!!!

Broadcasting stations will have a maximum power of 500 watts input and the wave length from 200 to 280 meters with telegraphy and with 220 to 230 with phone. They will only pay two-thirds of the preceding taxes; that is to say, with an antenna higher than 100 meters, a 500 watt station will pay 100,000 francs a year (2/3 of 100 francs per watt!!)

Licenses may be cancelled any moment by the postal telegraph administration, and this without the necessity of giving any reason whatsoever (absolutely arbitrary!).

Finally, the administration may at any moment and at the first request take possession of your station and use it thru its agents and this "at the expense of the licensee." Employees of the postal telegraph service will be loaded onto you, they will operate your station and it will be you who will pay for the tubes which they burn out!

You see that the French amateur situation has made some progress in ten years, but it is still very far from being compared to that of the lucky American amateurs!

Fortunately, all this is only a project, and even if it is carried into effect without great modifications (which is most probable) it would only be a decree and not a law, which alone could not be legal concerning the matter. And even if it were a law, the force of inertia works for us. How is it that they never discover an amateur who receives on a loop and who has never declared himself? How would you prevent an amateur transmitting "I

have 3.56 amperes in my antenna" and that the number 3.56 might mean "come and have dinner with me tomorrow"?

But it would take the bureaucratic administration which we enjoy ten more years to understand this!

LONG-WAVE HELP

(Concluded from page 79)

tion was in process of development, and nearly everything known was tried. For a while as many as ten stages of resistance-coupled radio-frequency amplification were in use, and POZ, the station then sending press, could be copied on a 6-ft. loop. The final circuit when I left New York had been boiled down to the use of an antenna, no stage of resistance-coupled radio, detector and one stage of audio, and a separate heterodyne. Also an extra two stages were employed to operate a loud speaker connected by a rubber tube with the dictophone recording set for the high speed traffic. This worked very well, I know, and the station is still in use receiving press, I believe from OUI.

Of great importance in the attempts to properly tune long distance stations is the use of very loose coupling. It has been my experience that while I could tune to POZ here, and read his signals with the primary at practically right angles, or adjusted so as not quite to be at zero coupling, when the coupling was increased to an angle of about 30 degrees between coils

POZ could not even be found, due to the interference from other stations near his wave. POZ is hard to tune too, but will be recognized when heard starting up by a characteristic increase in pitch or tone.

With sincere regards,

Yours very truly,

W. W. Lindsay, Jr., 6ZF.



You Need This "MAC - RADIO" TEMPOMETER

An accurate, easily operated device by which you can instantly compare the Standard Time used in all points of the World. An absolute necessity for all radio operators who are receiving either telegraph or phone station schedules throughout the World. IT TELLS YOU WHEN TO LISTEN FOR THAT CONCERT OR MESSAGE. FOR A LIMITED TIME ONLY with each tempometer we will include FREE OF CHARGE our folder giving: Standard Time Meridians of the World, also U.S. time zones and time sending stations, Broadcasting stations of U.S. and Canada with time used by each. Radio Tempometer Price \$1.00. Delivery return mail. Dealers write for discounts.

McCALLUM APPLIANCE CO.
Silver City, New Mexico

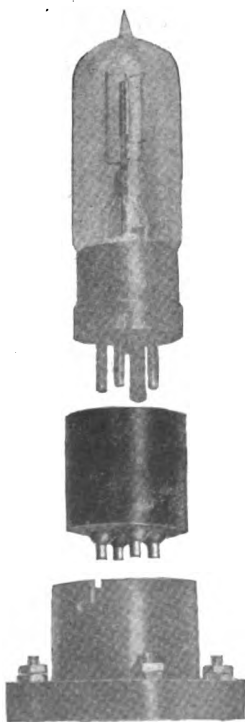
THE LAMB ADAPTER

The illustration shows our Adapter which will enable the use of WD-11-1½ Volt Tubes in equipment with standard sockets.

Made of insulating material with split tube contactors. Size 1⅞x1⅜. Connections all enclosed—Fool-proof—indestructible.

*Liberal discounts
to Dealers.*

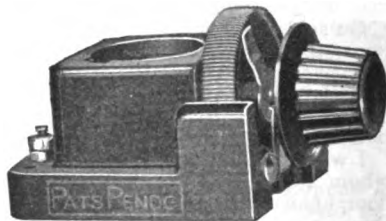
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KING Rheo-Socket

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Compact, increased efficiency, shorter connections, less wiring—brings in stations you never heard before. Make this a part of your up-to-date set.

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Burgess, the *Radio* Battery

—construction fully patented

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Listen in for Crosley Broadcasting. Our new station, WLW, is one of the largest and best in the country and can be heard in any part of the United States and Canada, east of the Rockies, with a Crosley Model X. This instrument, as in all of our larger units, incorporates one stage of Tuned Radio Frequency Amplification. We were the first to bring this feature on the market and have developed it to its highest degree. This simplifies tuning, increases the range and clarity and eliminates interference. This makes Crosley instruments popular wherever they are tried. Your Jobber or Dealer should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

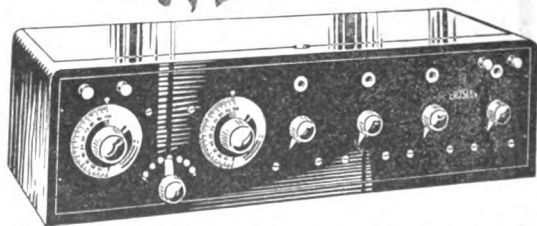
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CROSLEY MANUFACTURING Co.

Department QST 4

Cincinnati, Ohio



CROSLEY RECEIVER MODEL X. A four tube outfit the same as shown in the above scene. It consists of Tuner, One Stage of Tuned Radio Frequency Amplification (the feature that has made this instrument so popular) Detector, and two stages of Audio Frequency Amplification, in a beautiful mahogany finished cabinet. It will bring in distant stations loud and clear. Price without tubes, batteries, phones.....\$55.00

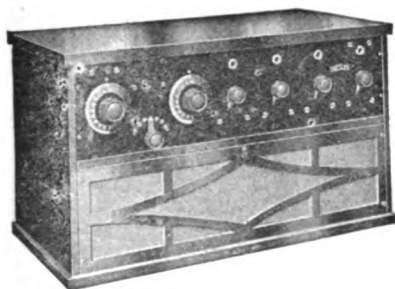
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CROSLLEY MODEL XXV

This beautiful mahogany cabinet is equipped with four tube panel incorporating the same units as the Model X, but the panel is of a different shape, as will be noticed from the illustration. This cabinet is arranged to take the Model R-3 Magnavox that can be quickly installed and hooked up to the set, but the Magnavox is not furnished at the price. Cabinet also contains space for "A" Battery, "B" Battery and battery charger if desired. A throw-over switch is provided to change from head phones to loud speaker. It is guaranteed to bring in broadcasting stations up to one thousand miles or more, loud enough to be heard all over the room. This beautiful instrument, without tubes, batteries or phones, sells for \$150.00.

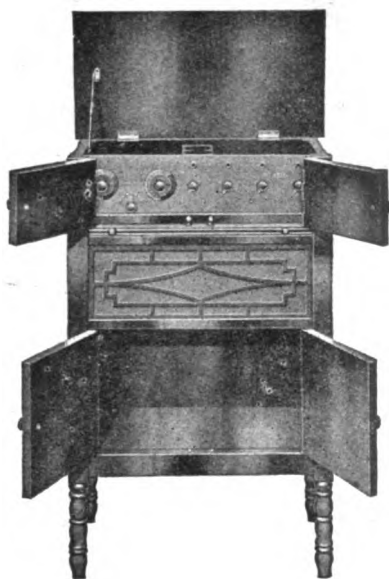
Three Beautiful Cabinet Models



CROSLLEY MODEL XV

Incorporates the same receiving apparatus as the other instruments on this page. Has special sound resonating chamber but without compartment for batteries. Can be set upon a table or stand. Will fill your room with music or other broadcasting. Mahogany finished. Price without tubes, batteries or phones \$70.00.

CROSLLEY
Better---Cost Less
RADIO



CROSLLEY MODEL XX

The same as CROSLLEY RECEIVER MODEL X in an upright cabinet with special sound resonating chamber. A hinged lid, when raised allows the operator access to every part of the receiving apparatus. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Has the same volume and range as the MODEL X. Mahogany finished. Price without tubes, batteries or phones \$100.00.

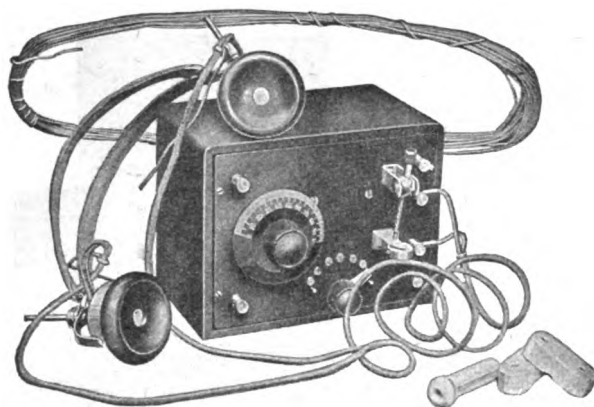
Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

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CROSLEY CRYSTAL RECEIVER MODEL I

This outfit complete as shown, is not only very efficient of its type, but is beautiful in finish and appearance, and complete. Later, if desired, additional units can be added, including audion detector, radio frequency amplifier and two stage audio frequency amplifier. Manufactured under the Pickard patents. Price of the set illustrated above complete with instructions is \$25.00.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

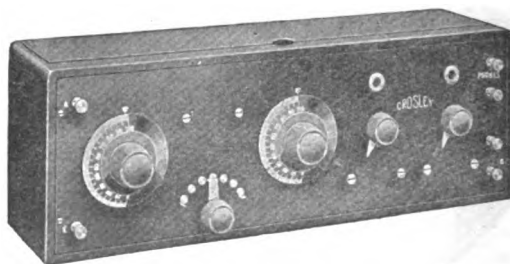
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HARKO SENIOR MODEL V

Greatly refined and improved gives better results than ever before. We guarantee it to bring in even distant broadcasting stations and believe it to be the most efficient one-tube receiving set on the market. With this unit, Denver has heard Schenectady, N. Y., and many other wonderful distance records have been made. Price without tubes is only \$20.00.

Three Smaller Models Of the Usual Crosley Quality



CROSLEY MODEL VI

A two-tube set similar to the MODEL X shown on the first page. This unit has approximately six times the range and volume of the Harko Senior. It consists of one stage of Radio Frequency Amplification and Audion Detector. It eliminates static to a large extent and distant stations are brought in clear and sharply. Price without tubes, batteries or phones \$30.00.

CROSLEY MANUFACTURING CO.
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Two Stages of Audio Frequency Amplification

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Can be Added to Any Set With This Unit

CROSLEY TWO STAGE AUDIO FREQUENCY AMPLIFIER.

This unit can be used to add two stages of Audio Frequency Amplification to any set on the market. It is composed of Crosley Sheltran Transformers and Crosley porcelain V-T sockets in a nicely arranged cabinet. It will increase the volume of your set about one hundred times. Price without phones, batteries or tubes.....\$25.00



Tuned Radio Frequency Amplification The Feature of Our Larger Units

Can be added to practically any set. Tuned Radio Frequency Amplification as developed by the Crosley Manufacturing Company is unquestionably a wonderful success. It increases the range for receiving outfits to a remarkable degree, and eliminates static and other forms of interference, and yet is simple to tune.

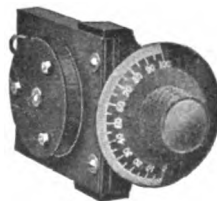


RADIO FREQUENCY TUNED AMPLIFIER—R. F. T. A.

Originally designed to be used in connection with the CROSLEY HARKO SENIOR MODEL V. Hook ups have now been worked out for its efficient use with Westinghouse, Grebe, Clapp-Eastham and other receiving sets. Complete instructions showing these hook-ups are furnished with each Radio Frequency Tuned Amplifier, or will be sent upon request to anyone free of charge. Price\$15.00

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for general catalog and leaflets.



RADIO FREQUENCY AMPLIFYING TUNER—R. F. A. T.

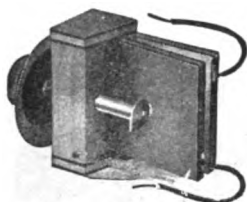
This takes the place, in a surprisingly successful manner, of a Radio Frequency Transformer. We have prepared a leaflet telling a great deal about this wonderful unit, with the instructions for hooking it up in various types of circuits, showing its use, not only as a R. F. A. T., but also as an interference and static eliminator or strainer. Price.....\$4.00

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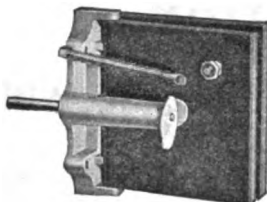
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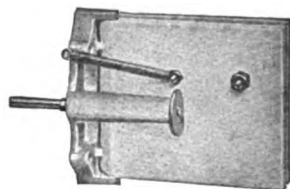
RADIO



MODEL A



MODEL B

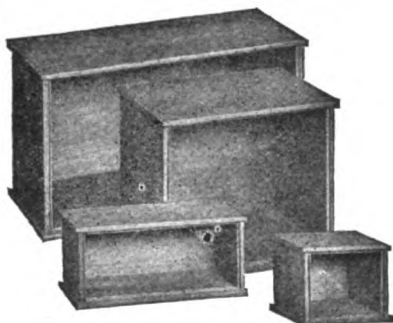


MODEL C

CROSLEY VARIABLE CONDENSERS

The CROSLEY VARIABLE CONDENSERS are unquestionably one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

Model A, .0005 Mfd. (Wood Frame).....\$1.25
 Model B, as illustrated, .0005 Mfd.....\$1.75
 Model C, .001 Mfd. (Porcelain Plates).....\$2.25



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Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish, and of the best workmanship.

The Crosley Radio Cabinets are made of hardwood Adam brown mahogany finish. Live dealers handle them—prices and sizes in our catalogue.

CROSLEY KNOB AND DIAL



Attractive and inexpensive CROSLEY KNOBS and DIALS are extremely well made for all required purposes. The dials are made of solid hard rubber 2½ in. diameter, with the letters and figures moulded into them and white enameled.

Furnished Standard for ¼" shaft or ⅜" shaft, optional—\$0.40.

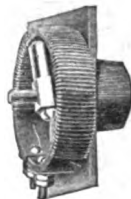
CROSLEY RHEOSTAT

Note the new Crosley Rheostat with ball bearing contact, patent pending.

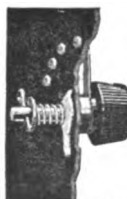
This rheostat permits exceptionally accurate and delicate variations of the filament current. With it, the best possible results are received from expensive vacuum tubes.

Unique construction allows the CROSLEY RHEOSTAT to be mounted on a panel of any thickness up to and including ¾ inch. A special grade of non-corrosive wire forms the resistance and results in highly efficient service.

This rheostat is much more attractive, works better and is easier to assemble than the old Crosley Rheostat. It is better in every way and yet the price is the same.....60¢



CROSLEY TAP SWITCH



The unique construction of CROSLEY TAP SWITCHES assures a constant tension and eliminates all possibility of the switch loosening and developing a faulty contact on the taps. A stationary washer of our own design has a soldering lug which makes possible a bus wire connection. All CROSLEY TAP SWITCHES are furnished with a newly designed tapered knob

and nickel-plated switch arm and bushing.

Price each complete.....30 cents

Switch Taps for the above made of brass, nickel-plated and complete with brass nut, 2½ cents each.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog

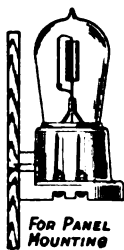
CROSLEY MANUFACTURING CO.
 DEPT. QST 4
 CINCINNATI, OHIO

CROSLY RADIO PARTS shown on these pages are the personification of economy and efficiency. The fact that they are endorsed and used by the best Radio Men in the country should be sufficient testimonial.

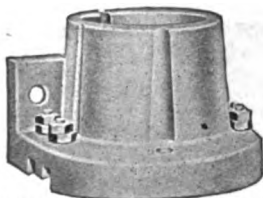
CROSLY

Better---Cost Less

RADIO

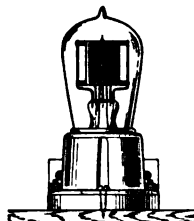


FOR PANEL MOUNTING



CROSLY V-T SOCKET

This socket has been pronounced by many radio engineers as the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency, service and practical unbreakability. Patents pending. Beware of imitators.
Made of porcelain for base, or panel mounting.....\$0.50

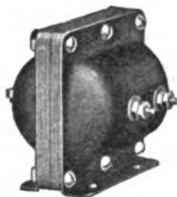


FOR BASE MOUNTING

CROSLY SHELTRAN

Incorporated in the design of the CROSLY SHELTRAN, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The CROSLY SHELTRAN is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.

Better—Costs Less—\$4.00



CROSLY VARIO-COUPLER PARTS

The CROSLY VARIO-COUPLER is made with the same accuracy as the CROSLY VARIO-METER, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.



Complete as shown in illustration, ready for assembly—\$1.50. Also furnished completely wound and assembled. "Better—Costs Less"—\$3.00



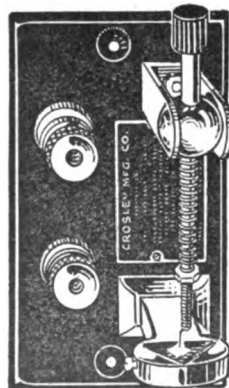
CROSLY BINDING POSTS

These are made in three sizes — $\frac{1}{8}$ " diameter, $\frac{1}{4}$ " diameter and $\frac{1}{2}$ " diameter. They are all of the same design, however, as shown in the illustration.

No. 1..... 5¢ each
No. 2..... 7½¢ each
No. 3..... 10¢ each

CROSLY CRYSTAL DETECTOR STAND

This unit is especially well constructed, neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystals, binding posts, etc., manufactured under the following patents: "Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 23, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement. —\$1.60.



CROSLY MAGFON

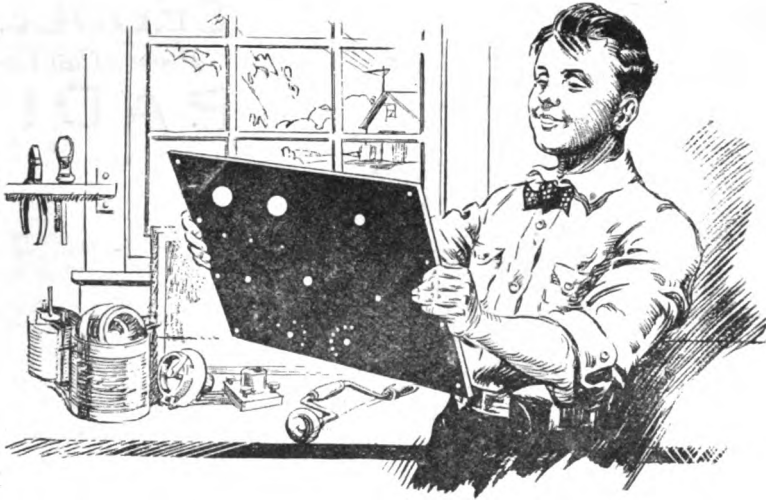
No Radio station is complete without this MAGFON. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the CROSLY MAGFON by simply inserting it in the back of the cabinet. Mahogany finished \$10.00.



Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

Send for Catalog.

CROSLY MANUFACTURING CO.
DEPT. QST 4 CINCINNATI, OHIO



This Panel Will Improve Your Set

CONDENSITE CELORON

The best panel made is none too good for your set. Dependable insulation is vital because it has a direct bearing upon the clearness and sensitivity of both transmission and reception.

Every thinking radio enthusiast certainly wants the highest type panel he can obtain and the surest way to get it is to insist upon Condensite Celoron.

This strong, handsome, jet-black material is not merely an insulating material—it is a radio insulation made to meet high voltages at radio frequencies. That is why it will give you greater resistivity and a higher dielectric strength than you will ever need.

Make your next panel of Condensite Celoron. It machines readily, engraves with clean cut characters and takes a beautiful polish or a rich dull mat surface.

An Opportunity for Radio Dealers

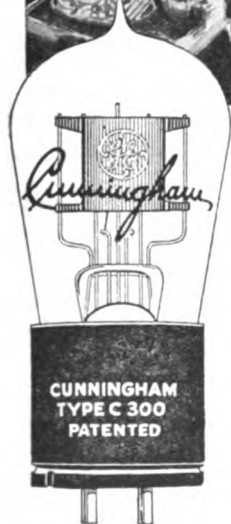
Condensite Celoron Radio Panels and Parts offer a clean cut opportunity to the dealer who is keen on building business on a quality basis. Write us today. Let us send you the facts. You'll be interested.

Diamond State Fibre Company
Bridgeport (near Philadelphia), Penna.

Branch Factory and Warehouse, Chicago.
Offices in Principal Cities

In Canada: Diamond State Fibre Co., Ltd., Toronto.

Cunningham TUBES



The trade mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

Assure Clearest Broadcast Reception

Nationally known for Super-sensitive Detector Action and Distortionless Amplification, Cunningham tubes are ideal for use in your home receiving set.

The results obtained from the best radio sets depend largely upon the vacuum tubes used. Cunningham Detector Tubes insure clear reception—maximum signal strength and an absolutely quiet receiver in the absence of incoming signals.

Cunningham Distortionless Amplifier Tubes perform a great service. In making possible the reception of distant stations and the use of loud speaking telephones, these tubes bring into your home the music of great concerts and the singing of famous artists, aiding in the cultivation of the musical side of home life.

TYPE C-300

Super-Sensitive
DETECTOR

\$5.00

Amplifies
as it
Detects

TYPE C-301

Distortionless
AMPLIFIER

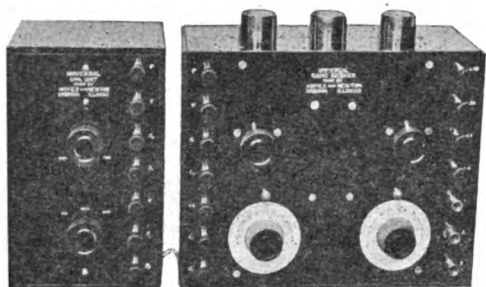
\$6.50

Patent Notice Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

E. J. Cunningham

Home Office:
248 First Street
San Francisco, Cal.

Eastern Representative:
154 West Lake St.
Chicago, Ill.



The Biggest Advance Yet Made Toward Elimination of Distorted Signals is Found in the Universal Ra- dio Receiver and Coil Unit

This set has been designed to cover all the fine points of radio technique.

The wave length range possible with Coil Unit is 180 to 6200 meters. Wave lengths ranging from 200 to 2500 meters may be covered when using the standard coupled circuit.

The proposed changes in broadcasting wave lengths by the government require a larger wave length range than in use today which means that the average radio receiver must be altered to receive all broadcasting waves. The proposals cover ranges from 200 to 2500 meters.

The terminals of various circuits are brought out to binding posts which allows the operator to use any of the following standard hook-ups; single circuit, two circuit, regenerative, or oscillating.

FINE TUNING OF THE SET is accomplished by means of the **VARIABLE CONDENSERS**.

Weak and strong signals may be received alike **WITHOUT DISTORTION**.

This set is very compact, flexible in adaptation of various circuits to any desired hook-up. It is easy to operate because of the convenient location of the various adjustments and, at the same time, the set has a very high efficiency. This set has been thoroughly tested at the Bureau of Standards and the results are highly satisfactory.

Cabinets are finished mahogany and the panels are of bakelite.

Size of Universal Coil Unit, 5 $\frac{3}{4}$ "x9 $\frac{1}{4}$ "x4 $\frac{1}{4}$ "

Size of Universal Radio Receiver, 11 $\frac{1}{2}$ "x9 $\frac{1}{4}$ "x4 $\frac{1}{4}$ "

We guarantee the workmanship and quality of this set to be of the highest type.

Give a Universal Receiver and Coil Unit for a Christmas present.

Dealers write for our proposition. The demand for this set will be tremendous everywhere. A simple demonstration will bring all the orders you can handle.

\$110.00 F. O. B. Factory

HAYES & NEWTON

115 N. Market

Urbana, Ill.

O-B Radio Co.

Distributors for

Colin B. Kennedy Co.
Horne Receiving Sets
Remler Accessories
Horne Accessories
Cunningham Tubes

If your dealer can't supply you, write to us direct for any standard Radio material.

O-B Radio Company

Flatiron Hotel Bldg., 1730 St. Mary's Ave.
Omaha,

Nebr.

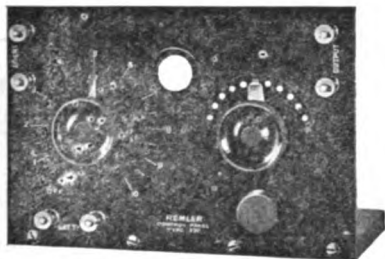


SOUTHERN RADIO CORPORATION

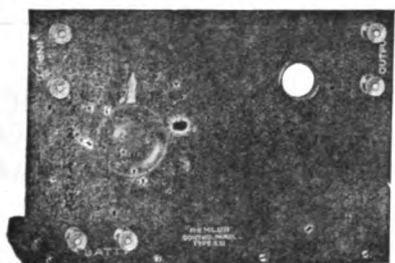
Radio Engineers and Jobbers
905 Realty Building, Charlotte, N. C.

REMLER

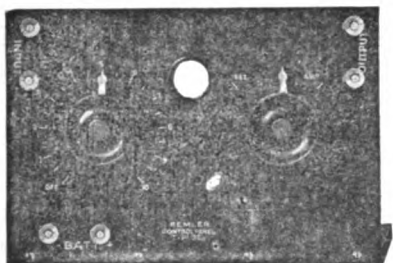
APPARATUS THAT RADIATES QUALITY



Remler Type 330 Detector Panel. Price \$8.50



Remler Type 331 Amplifier Panel less transformer Price \$6.00



Remler Type 333 Amplifier Panel less transformer Price \$9.00

THE MOST POPULAR Panels ON THE MARKET

IN designing these Remler Control Panels, Remler Engineers combined every point necessary for efficient detector and amplifier tube control with special features of construction for the convenience of the user. No process of manufacture that would make these panels efficient in operation and beautiful in appearance has been neglected.

Each panel is a complete unit, mounted on a hardwood base for table use, but so designed that it may be easily mounted in a cabinet. The input and output binding posts are located on opposite sides of the panel at a standard height to facilitate the neat and easy connection of other Remler units.

The 330 Detector Panel contains the Remler Grid Condenser and Variable Grid Leak unit. Also the patented Remler "A" Battery Potentiometer for plate voltage control—an item very necessary for obtaining maximum efficiency from the sensitive gas filled detector tubes.

The 333 Amplifier Panel contains the Remler Rotary Cam Switch which does the work of two jacks and plug in cutting in or out steps of amplification.

All panels are of highly polished black Bakelite and only Remler standard Quality parts are used in the assembling of the unit. All lettering is recessed and filled with a special white enamel that will not discolor or chip out.

NEW REMLER CATALOGUE

Send 10¢ for new 40 page Remler Catalog just off the press containing circuit diagrams for Remler Apparatus and other useful information, including a table of inductance, capacity and wave length.

REMLER RADIO MFG. CO.

FACTORY AND HOME OFFICE
248 FIRST ST. SAN FRANCISCO, CAL.

EASTERN REPRESENTATIVE
154 W. LAKE ST. CHICAGO, ILL.



PARAGON RA-10

DA-2

Only New England Distributor of
ADAMS-MORGAN CO.

PARAGON
T. M. Reg. U. S. P. O.
RADIO PRODUCTS

ONLY NEW ENGLAND DISTRIBUTOR OF

Radio Improvement Co. Improved Anti-Capacity Jacks,
Telephone Plugs & Switches

**ONLY DISTRIBUTOR OF
WALTHAM CONDENSERS**

3 PLATE VERNIER.....	\$1.75		
11 PLATE .00025.....	3.25	With Vernier....	5.00
13 PLATE .00027.....	3.50	" "	5.00
17 PLATE .0004.....	3.75	" "	5.50
21 PLATE .0005.....	4.00	" "	6.00
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Also Distributor of the

BETTER GRADES OF RADIO SETS AND PARTS
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TRADE MARK

A Neat Back Mounting Binding Post Panel
For UR **DRAWER SHELF**
NP, non-removable heads, with special provision for jumpers. Mounted on $\frac{1}{4}$ " grained HR, 2" x 5". Complete with soldering lugs and NP mounting screws.
Type R7 Receiving Cabinet 1.10; T4 Tuning Cabinet .80; A5 Amplifier 1.05; DA9 Detector-Amplifier 1.35; AG2 Aerial-Ground .60.

TERMNAPANELS are sold direct to user only, Postpaid in U.S. and possessions.

A. L. WOODY (TERMNAPANELS)
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AMATEURS!

Are you ready for the Transatlantic Tests?

We carry a complete line of parts for both receiving and transmitting.

Radio Sales & Service Co.

Ypsilanti, Mich.

Adds 1000 Miles with Bradleystat!

Allen-Bradley Co.:

I am situated in Boston harbor and heard Anacostia, D. C., Pittsburgh and Schenectady with wire rheostats of various makes.

Attached a Bradleystat and now pick up Kansas City, Atlanta, and heard music from Havana, Cuba. My set no longer has tube noises that worried me with wire rheostats, and do five times the tuning with the Bradleystat.

I would not advise any person or manufacturer to use any other tube controller, as they will surely go to the Bradleystat, even at three times the price.

Robert C. Daly.

Winthrop, Mass.



Retail Price

\$1.85

P. P. 10c Extra



Fully Guaranteed
Against Defects

Extend your receiving range, too!

Mr. Daly's letter is one of hundreds received from enthusiastic Bradleystat users. The improvement in range, clearness and speed of tuning surprises everyone. Try a Bradleystat, tonight.

Another Allen-Bradley product is the Bradleyometer, the perfect potentiometer. If you use a potentiometer in your set, write for latest Bradleyometer bulletin.

Allen-Bradley Co.

Electric Controlling Apparatus

277 Greenfield Ave., Milwaukee, Wis.

MEMBER OF

National Radio Chamber of Commerce



Bradleystat

REGISTERED U. S. PAT. OFF.

PERFECT FILAMENT CONTROL

The Telmacophone in Every Home



The Telmacophone in *your* home provides entertainment and instruction for every member of the family. No one has to take turns or miss any part of the program. No need to change headphones from one person to the other. You are always assured a loud, clear tone. Everybody can hear everything, clearly and distinctly.

The tone is produced by *original Baldwin Type C. Unit* and reflected into the outer horn. There is no metallic effect. Finished in black and gold to harmonize with any surroundings.

Correctly designed—fairly priced—unreservedly guaranteed. The **ORIGINAL \$20.00** loud speaker and still the **BEST**. With original **Baldwin Type C. Unit**. Price complete **\$20**

If your dealer hasn't the Telmacophone in stock, send us his name and order direct from this ad enclosing \$20.00. Prompt shipment. *Write for new free catalog.*

TELMACO
Quality Radio Exclusively

JOBBERS! DEALERS! The demand for the Telmacophone is great. Write for new catalog and discounts on our complete line. We are also distributors for the better standard lines.

RADIO DIVISION
TELEPHONE MAINTENANCE CO.
20 S. Wells St. Dept. D Chicago, Illinois

WIRE YOUR OWN RECEIVER AND SAVE 50%

B&K UNWIRED RECEIVER

Consists of

Two B&K variometers, 1 B&K variocoupler, 1 switch, 10 contact points, 2 switch stops, 1 FADA socket, 1 FADA rheostat 1 .002 and 1 .00025 Dubilier Micadon, 10 rubber binding posts, 3 Radion dials, 5 lengths bus wire. Mounted on shielded engraved rubber panel and solid mahogany cabinet.

Complete, Postpaid **\$32.50**

BONDUAUX & KNIGHTS

1115 Kelly Street, Bronx, N. Y.

NOTICE SPECIAL

FOR THIS MONTH
**VERNIER
CONDENSERS**

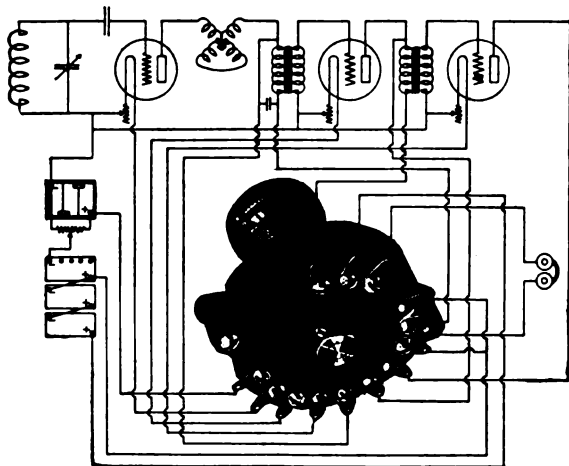


11 PLATE....	\$2.25
23 PLATE....	3.00
43 PLATE....	3.50

PRICE INCLUDES
KNOB & DIAL
ALUMINUM PLATES
FORMICA END PLATES
GUARANTEED

M. C. E. Co.
Manufacturers
Indianapolis, Ind.

Instant — Positive — Noiseless



Paragon Stage Control Switch

Plugs and jacks are now obsolete. The PARAGON Stage Control Switch combines the functions of three multi-circuit jacks and the telephone plug. It controls, automatically and progressively, all the filament circuits, plate battery circuits and input and output circuits of the detector-two-stage amplifier.

Switching from stage to stage is instantaneous, positive, noiseless. All battery circuits are protected. The

wiring of amplifier is simplified.

The wiring diagram, illustrated above, shows the method of connection when this new PARAGON switch is employed for control of detector and two-stage

amplifier. The switch may also be used for an unlimited combination of vacuum tube circuits. $2\frac{3}{8}$ " in diameter, $\frac{3}{4}$ " in thickness. Price, \$3.00.

Send for new illustrated catalog of Paragon radio parts.

Also Manufacturers
of
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Transmitters
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ADAMS-MORGAN CO., 4 Alvin Ave., Upper Montclair, N. J.

PARAGON

Reg. U. S. Pat. Off.

RADIO PRODUCTS



Concealed Cord Tips

THIS is an important feature of the Manhattan Headset. Concealed Cord Tips have two real advantages:

The first is the elimination of all possibility of unbalancing the receiving set and decreasing the strength of the headset signals by having the hand come in contact with exposed cord tips or terminals. The loss of strength due to this contact is often as great as 50%.

Manhattan Headsets have concealed cord tips.

By enclosing the cord tips, all obstructions on the outside of the receiver are removed and the smooth molded case will not scratch the handsomest furniture.

The Manhattan Headset case is free from obstructions.

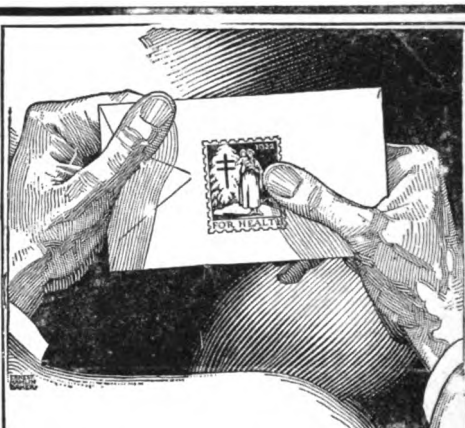
In addition, the cords of the Manhattan Headset are designed with two other important features.

1. Strain on the terminals is relieved by a tie-cord attached to a small eyelet in the case.
2. The polarity of the cords is indicated and the terminals within the receiver case marked. This permits the headset to be correctly connected in the circuit to give the best results.

Manhattan Headsets are prized alike by professional and amateur operators. Identify them by the "M-Flash-Seal" on the back of each receiver case. Look for it when buying your Headset. It is your guarantee of Manhattan quality.

MANHATTAN
ELECTRICAL SUPPLY CO., INC.
Makers of the Famous Red Seal Dry Batteries.

New York Chicago St. Louis
17 Park Place 114 So. Wells 1106 Pine St.
Street
San Francisco 604 Mission St.



Honor these Seals

A NATION-WIDE movement is carrying on a warfare against the scourge of Consumption. In saving over 100,000 lives last year, it actually *cut the death rate from tuberculosis in half.*

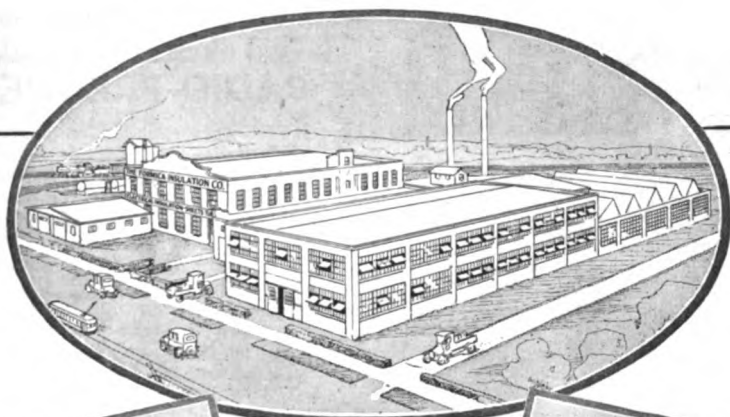
Each year these organizations sell Tuberculosis Christmas Seals. The proceeds from these sales are devoted to the work of caring for and curing tuberculosis patients and to educational and other work to prevent the dread disease.

Buy these Seals and urge your friends to buy and use them. To do this is both Charity and Patriotism.

Stamp Out
Tuberculosis
with
Christmas
Seals



THE NATIONAL, STATE, AND LOCAL
TUBERCULOSIS ASSOCIATIONS OF
THE UNITED STATES



The Formica plant today



A year ago



Nine years ago

~Appreciation and Progress~

NINE years ago the Formica Insulation Company began business in the small building shown at the right.

Two years ago the demand for the product from every branch of the electrical industry, forced a move to the building shown at the left where capacity was greatly increased.

Now, recently constructed additions to that plant have brought into existence the plant shown at the top—a plant with more than twice the capacity of the company—a year ago—and the largest in the industry.

Appreciation of a better insulating product—one that at very slightly increased costs removes thousands of troublesome and costly possibilities for insulation failure—has built the business.

*If you do not know or use Formica
write us now for literature and prices*

THE FORMICA INSULATION COMPANY

4620 Spring Grove Ave., Cincinnati, Ohio

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318 Title Building, Baltimore, Md.

422 First Avenue, Pittsburg, Pa.
1210 Arch St., Philadelphia, Pa.
Sheldon Bldg., San Francisco, Cal.

FORMICA

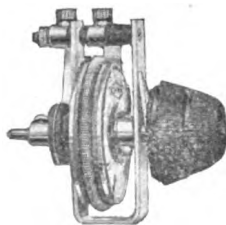
A Laminated Phenolic Condensation Product

SHEETS TUBES RODS



Radio Rheostats of Reputation

Protecting every C-H Radio Rheostat stands a guarantee stronger than human hands can write. The decades of persistent and successful development of rheostatic control by the engineers of CUTLER-



C-H Radio Rheostats are built in two styles, Type 11601-H1 with vernier adjustment for detector tube control and Type 11601-H2 is furnished without vernier for amplifier tube control. Both rheostats have a range of four ohms with one ampere current capacity.

HAMMER have inspired a faith in their trade-mark that is far too worthy to forfeit.

Engineers the world over accept this mark as unfailing assurance of electrical and mechanical perfection—the signature of approval of the master rheostat builders. It is a protection you should demand in the purchase of your radio rheostat—a device in which precision and reliability are essential.

Type 11601-H1
with vernier
Type 11601-H2
without vernier

\$1.50
\$1.00

THE CUTLER-HAMMER MFG. CO.
Milwaukee, Wisconsin

CH RADIO RHEOSTATS
BUILT BY RHEOSTAT BUILDERS

RT-5 and RT-6 Have Taken the "Freak" out of RADIO FREQUENCY

The RT-1 Frequency Transformer covering a range of 175 to 500 meters, built by the Radio Service Laboratories, has long been recognized as the best transformer of its kind on the market. It is with pardonable pride that we announce two new types of radio-frequency transformers that are far ahead of anything on the market today. Realizing that it is impossible to obtain maximum efficiency for both the amateur, who builds his own set and is only interested in C.W. work; and for the man who purchases his set and is only interested in the broadcast reports and entertainments, we have perfected a transformer for each class. We have more than doubled the amplification by cutting the range in half.

AS A RESULT WE NOW OFFER

TYPE RT-5 a transformer of high radio frequency amplification specially selected for the first stage for the amateur range only, 150 to 300 meters. RT-5A is a transformer that is interchangeable for the second and third stages.

TYPE RT-6 a special transformer of equally high radio frequency amplification for the first stage, for the broadcast range only. 300 to 600 meters. RT-6A is a transformer that is interchangeable for the second and third stages.

These new types are put through the famous triple test and are still the only completely shielded iron core radio frequency transformers on the market. These new types have literally taken the "Freak" out of Radio Frequency and give

"Louder Signals with less noise

Greater Range with same equipment."

RADIO SERVICE LABORATORIES Transformers by actual test are superior to any domestic or foreign make in the market. For sale at reliable electrical shops or stores where Radio supplies are sold.

All types retail at \$6 each.

Send for your complimentary copy of booklet on Radio Frequency with schematic diagrams.

Rasla Sales Corporation

National Distributors

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Western Sales Agents

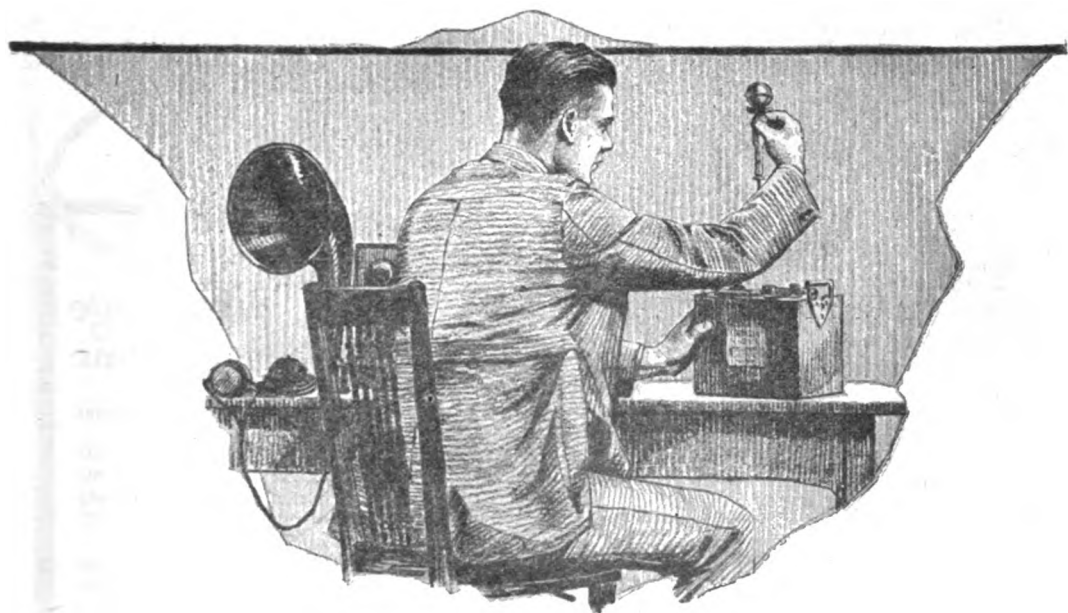
Detach & Company

555 Turk Street, San Francisco, Calif.

Western Radio Distributing Co.

1114 L. C. Smith Building, Seattle, Washington





Tungar

Your Battery

Should be Kept Fit

The Tungar Battery Charger makes it a simple matter to keep your storage battery tuned-up and fit. With it you can recharge your battery at home—and at little cost.

Tungar is a small, compact rectifier, which can be connected with any a-c. lighting circuit. It is easy and safe to operate—in fact, requires no attention after starting. And when properly connected, the current can go only the one way, eliminating any danger of ruining the battery.

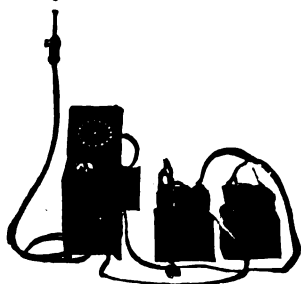
There is no excuse for allowing your battery to run down and spoil the evening's fun. A Tungar doesn't cost much—and it charges the starting and lighting battery in your automobile also.

Send for our new booklet on Tungars for radio, if your dealer cannot supply you.

Address Merchandise Dept., General Electric Company, Bridgeport, Conn.



This enables you to keep batteries fit, right at home. With simple attachment, it will also charge "B" storage batteries.



This is the way "B" Storage Batteries are charged with Tungar and attachment.

General Electric Company

General Office
Schenectady, N.Y.

Sales Offices in
all large cities

35A-78C

No Wireless Receiving set complete without it



Make it the GREATER Radio Christmas

THE success of Magnavox today comes from the patient research and experiment our engineers carried on in Radio's "pioneer" days.

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. **\$85.00**

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc.... **\$45.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.
2 Stage AC-2-C **\$80.00**
3 Stage AC-3-C **110.00**

Magnavox products can be had of good dealers everywhere. Write us for copy of new illustrated booklet.

The Magnavox Co.
Oakland, California
N. Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio
The Reproducer Supreme



Recharge Your Battery at Home

Charges both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a **Valley Charger** and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge it or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parallel so that they can also be charged.

SATISFACTION GUARANTEED.

If your local distributor cannot supply you, write direct to

VALLEY ELECTRIC COMPANY
Department Q, ST. LOUIS

- - - - - Mail the Coupon - - - - -

Valley Electric Co., Dept. Q, St. Louis, Mo.

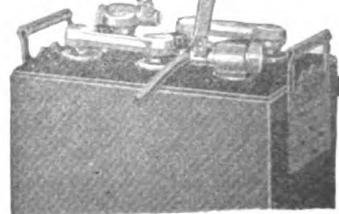
Gentlemen: I am enclosing money order (or check) for \$18.00, for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory I will return it and get my money

Name _____

Address _____

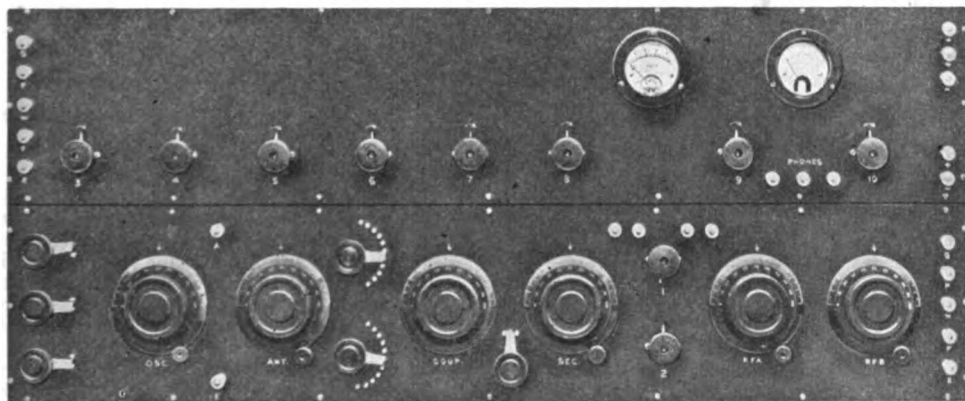
\$18.00

F.O.B. St. Louis



“Super-Heterodyne, the Rolls Royce Method of Reproduction”

E. H. ARMSTRONG



**Armstrong Super-Heterodyne Receiver 160 to 850 meters, 850 to
to 25,000 meters—Average Range 3000 miles**

THIS METHOD OF RECEPTION USED BY

**Paul F. Godley at Ardrossan, Scotland and received 27 American
Amateurs 3000 miles.**

Commercial Ship and Shore Traffic 3000 miles and over.

Advanced Amateurs for Extremely Long Distance Reception.

Obtainable Exclusively thru

Experimenters Information Service

Designers of the Highest Class Radio Apparatus in the World

23d Floor 220 West 42nd Street, New York City

Request Catalog K covering full line.

CAT. No. 50
Now
Price \$1.



Exterior view of the sturdy PACENT Universal Plug.

The Radio Amateur Knows

Every control perfectly adjusted—bulbs bright as you dare risk them—all connections tight—every detail perfect, you suppose. You're straining your ears—pressing the headphones closer—but can't quite get the signal.

There may be something wrong with your Plug contact. Pacent Universal Plugs are the first choice of most amateurs, because they realize the importance of perfect contact.

The Special spring connectors of the Pacent Plug form a perfect biting contact with the cord tips or conductors and become tighter the more the cords are stressed. The Pacent Plug is used and endorsed by leading radio experts.

Send for descriptive Bulletins QD102.

PACENT ELECTRIC COMPANY
INCORPORATED

Executive Offices: 22 Park Place, New York, N. Y.

BRANCH OFFICES

PHILADELPHIA,
Bourse Building

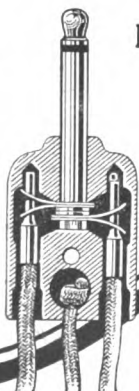
WASHINGTON, D. C.
Munsey Building

CHICAGO
23 So. Clinton St.

SAN FRANCISCO,
Sheldon Bldg.



Interior of
PACENT
Universal
Plug showing
special
spring con-
nectors.



Dont Improvise
"Pacentize"

"This is
A Radio
Christmas"

Assembled

But Not Wired

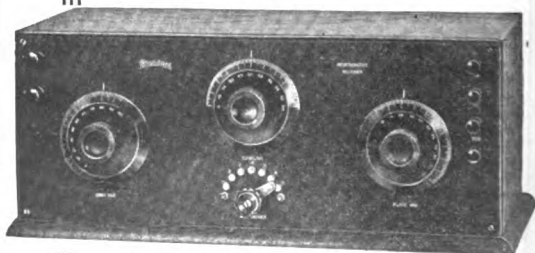
A new
Method of
Buying
Radio
Equipment

The STANDARD Idea

Buy your radio instruments according to the Standard Idea—a new way and a cheaper way. Our full line of instruments, including the popular Detector and Two-Stage Amplifier and the Multiple Wave Tuner, embodies the latest developments in radio practice. These instruments are delivered to you—completely equipped—but *not wired*. You do the wiring yourself, using our simple diagrams and instructions, and save fully 20% over what you would usually pay for an instrument of this kind.

The STANDARD IDEA is the latest thing in Radio. It saves your money and improves your knowledge of the science of radio. It saves money because it enables our factory to eliminate the costly operation of hand wiring; an interesting job that you can do in your spare time.

Write today for a description of the various instruments we make and their prices. Ask about our offer to ship any instrument on receipt of 1/3rd the purchase price, subject to refund if the instrument does not come up to your expectations.



STANDARD ASSEMBLING CO.
6 Stone St., New York

ARE YOU A GOOD GUESSER?

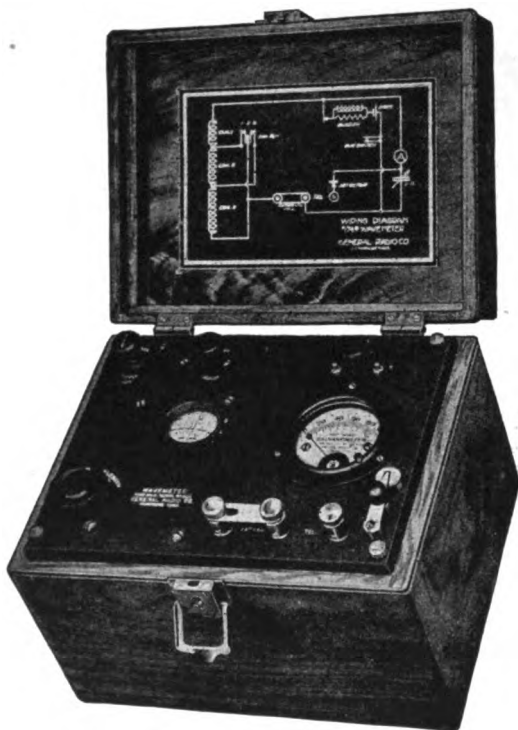
Direct reading.

Range 150-3,000 meters.

Suitable for all types of transmitting and receiving stations.

Calibrated from the same standards and with the same accuracy as the wavemeter furnished by us to Mr. Paul Godley in last year's Trans-Atlantica. This was the wavemeter whose calibration checked so accurately with both the American and English standards.

Used in many of the broadcasting stations of national importance, as well as very extensively in the Government service.



TYPE 174-B WAVEMETER

If you are, you may not need a wavemeter. But if you believe in knowing and not guessing a wavemeter becomes a necessity.

The wavemeter you desire must first of all be accurate and should also be easy to operate. These points with many others are incorporated in our Type 174-B wavemeter. A full description of this meter is not possible here, but is found in our **Bulletin 707-Q** which will be sent without charge on request.

PRICE, COMPLETE, \$68.00

Every local radio club should have one of these meters to check each member's station.

GENERAL RADIO COMPANY

MASSACHUSETTS AVENUE AND WINDSOR STREET

CAMBRIDGE 39

MASSACHUSETTS

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

Standardize on General Radio Equipment Throughout

HOMCHARGE



your
**RADIO
BATTERY**
for
A NICKEL

Enjoyable Radio Concerts and maximum receiving range are obtained only when your battery is fully charged.

Don't be bothered with the inconvenience and expense of taking your battery to a service station every few days for recharging. The

RADIO HOMCHARGER DE LUXE

has been designed especially for this purpose. It charges your "A" or "B" battery over night without removing from the living room—gives taper charge—cannot harm your battery in any way. Simplicity itself. Only two wearing parts, replaceable after several thousand hours use for One Dollar.

An Ornament for Your Living Room
Beauty has been combined with utility in the NEW RADIO HOMCHARGER DE LUXE. The body is beautifully finished in rich Antique Mahogany—the base and fittings in a handsome, dull gold. Equipped with rubber feet, it cannot mar polished surfaces. It harmonizes with the finest living room.

Over 50,000 Homchargers in Use
50,000 users have heartily endorsed the HOMCHARGER. Beware of imitations when buying and insist on obtaining the genuine which bears our registered trade name, HOMCHARGER. Furnished complete. No extras to buy. Price \$18.00 (\$25.00 in Canada) at all good dealers, or shipped prepaid upon receipt of purchase price.

Booklet illustrating the NEW RADIO HOMCHARGER DE LUXE in actual colors is FREE for the asking. Send for your copy today.
DEALERS—JOBBER: Over 150,000 HOMCHARGERS will be sold this fall and winter. Send for your copy of "HOMCHARGER Business Builders" and see how you can get your share of this business.

CAUTION

When buying a Rectifier insist upon the following:

1. **SELF-POLARIZING FEATURE**, otherwise your battery may be ruined through reverse charging.
2. **AT LEAST FIVE AMPERE CHARGING RATE**, otherwise it will require several days to fully charge your battery.
3. **UNDERWRITER'S APPROVAL**, otherwise in case of fire your insurance may be void.

The HOMCHARGER is the only Rectifier at any price which combines the above, three NECESSARY HOMCHARGING features.

The Automatic Electrical Devices Co.

127 West Third St., Cincinnati, Ohio

*Largest Manufacturers of
Vibrating Rectifiers in the World*

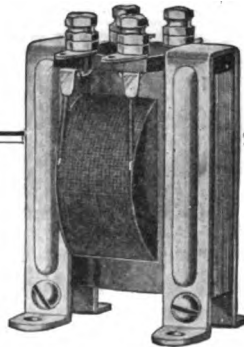
BRANCH OFFICES

NEW YORK CHICAGO PITTSBURGH
DETROIT DALLAS
PHILADELPHIA LOS ANGELES
BALTIMORE MINNEAPOLIS ATLANTA
ST. LOUIS NEW ORLEANS



— SEE A FOR WALL MOUNTING —

— OVER 50,000 IN USE —



No. 45

Price
\$7.00

Jefferson Quality— Your Protection

The amplifying Transformer is one of the most important integral parts of the Radio Receiving Set. Probably no other part is more subject to quality. Its functions are so delicately performed that satisfactory results are most dependent on the performance of this little instrument.

THE YEARS OF EXPERIENCE and the high quality which enters into the construction of JEFFERSON AMPLIFYING TRANSFORMERS make them the first choice of discriminating amateurs.

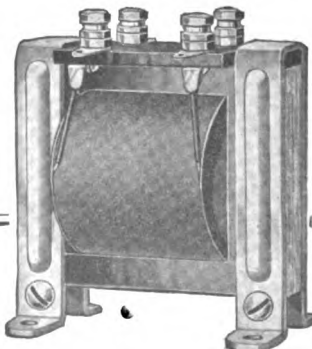
THE USE OF THE FINEST ROLLED core iron and the compactness of the coil windings reduce the inherent capacity effects, and **ELIMINATE HOWLING AND DISTORTION AND BRING IN THE FULL CLEAR TONE IN VOLUME.**

**"Use Jefferson Transformers
for Best Results"**

Send for Descriptive Bulletin.

Jefferson Electric Mfg. Co.

425 S. Green St., Chicago, U.S.A.



No.
41

Price
\$4.75



Owners of Amrad Receivers

Get a new Amrad 2 step R. F. Amplifier. Hooks on your present Amrad Tuner with no change in wiring. Eliminates QRM and doubles your range. **\$40** Complete with Radiformers. Immediate delivery for Christmas giving.

ANNOUNCING

"Something Old, Something New"

The old man, Mr. L. L. Lynn, one of Chicago's pioneer radio men, announces with pleasure the formation of the LYNN RADIO COMPANY and the opening of their radio studio at the above location.

To old A.R.R.L. men we offer the latest, most up-to-date line of sets and parts in Chicago. Every item brand new stock,—just what you need to put your station in shape for the coming season.

Latest types Amrad and Grebe sets, Baldy Fones, full line of Fada and Pacent parts ready for delivery over the counter or by mail. Come and inspect the latest apparatus and meet the old gang at "Radio Center."

Personal Service - - And the Broadest Radio Guarantee Ever Written

To the new class of radio men,—the broadcast fan—we offer a service you will like. We want you started on the right track. Expert authoritative advice and explanation of present day radio without charge or obligation.

Don't buy the first set you see. Let us

recommend one suited to your requirements and pocketbook.

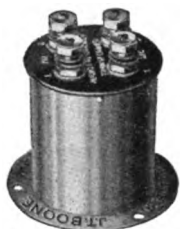
Two weeks trial on all radio sets and parts. Money refunded if you are not satisfied. The broadest guarantee ever made by a retailer. Why not come and see us today? Ask about our special installation service for Chicago customers.

LYNN RADIO COMPANY

STANDARD NATIONALLY ADVERTISED
RADIO EQUIPMENT

Sixth Floor Consumers Building
220 South State St — Chicago, Ill

A NEW STANDARD ESTABLISHED



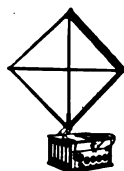
Audio Frequency
Price \$8.50

The advent of the J. T. Boone Mfg. Co.'s Radio Products has established a new Standard of Efficiency.

The "Boone" Radio Frequency Transformer is the materialization of the "DX Fiend's" dream. One or two stages added to your present set will produce almost unbelievable results in increasing your range.

The "Boone" Audio Frequency Transformer is a fit companion, producing powerful, distortionless amplification. Perfect shielding, correct impedance values of the windings, and careful manufacture account for its unusual high efficiency. If you wish to thoroly enjoy broadcast programs, be sure your Audio Transformers are "Boone."

These devices are compact and pleasing in appearance. They are carefully and rigidly tested and inspected. Instructions and proven wiring diagrams accompany each transformer.



For the man who desires a high efficiency complete set, a "Boone" Receiving Set is unquestionably "The Ultimate Solution."

Write for complete descriptive literature of our products.

J. T. BOONE MFG. CO.

3469 E. Jefferson Ave.,

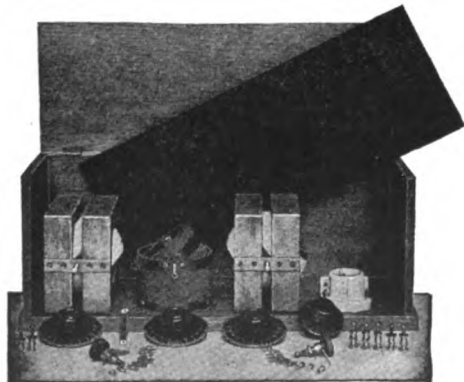
Detroit, Michigan



Radio Frequency
Price \$7.50

SAVE MONEY!

SAVE 50 to 60% on the cost of a high grade receiver—and have the fun of making it yourself! This set, properly assembled, will pick up radio concerts in radius of 500 miles or more. We furnish the following parts, just as illustrated:—



National Variometers

Beautifully finished. Especially adapted for reception of concerts, lectures, etc. on 250 to 485 meter wavelengths. Each, postpaid **\$4.00**

National Variocouplers

This coupler permits the sharp tuning necessary to get distant stations. Highest efficiency on 150 to 485 meter wavelengths. Each, postpaid **\$3.50**

	Actual Value
2 National Variometers.....	\$8.00
1 National Variocoupler	3.50
1 Selected Quarter-Sawn Oak Cabinet, 7x18x7, beautifully finished.....	8.00
1 Hard Rubber panel 7x18.....	2.25
3 Composition Dials, clearly and finely graduated	3.00
1 Rheostat with knob & pointer.....	1.00
1 V. T. Socket	.50
1 Grid Leak and condenser.....	.40
14 Contact points, 2 switch levers, 7 binding posts, 4 switch stops.....	2.05
Total actual value.....	\$28.70

OUR SPECIAL OFFER

All parts listed, complete with diagram showing how to drill panel—Postpaid to any part of the country

\$23.00

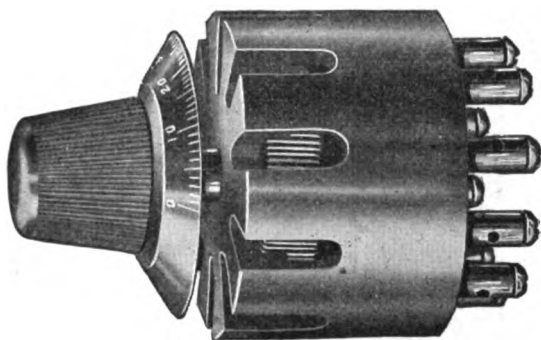
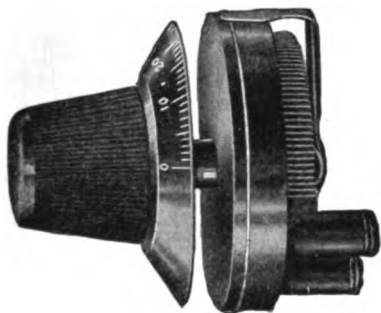
Deal rs - write or wire for proposition

NATIONAL RADIO CO., INC.

1302 So. Vandeventer,

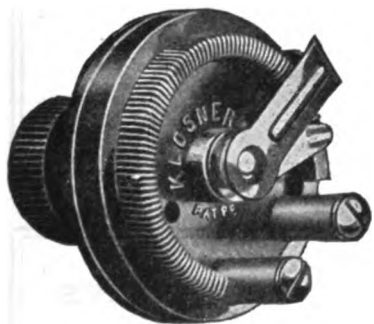
St. Louis, Missouri

VERNIER Rheostat MODEL 200



The AMPLITROL

No Panel can be up-to-date without these two



MODEL 100 The ORIGINAL VERNIER Rheostat \$1.50

DEALERS

No instruments on the market surpass the Klosner in neatness of design or quality of material and workmanship. Show your customer a Klosner and any other kind—he selects the Klosner regardless of any difference in price. Order through your jobber.

ONLY A RHEOSTAT WITH A
VERNIER CAN MAKE YOUR
SET MORE SENSITIVE

It is impossible to tune out interference without perfect adjustment of your detector tube. No ordinary rheostat can give you the fine adjustment necessary.

The Klosner VERNIER Rheostat has a micrometer adjustment that permits gettingtng EXACTLY on the very spot for perfect reception.

The Klosner operates both coarse and fine adjustments with ONE knob—a feature protected by broad patent claims. Wire-wound like all true electrical instruments.

And it has a graduated DIAL to show just where it is set. No guessing.

Condensite, phosphor bronze contacts, white graduations on black dial, \$1.50.

DOES AWAY WITH PLUGS AND
JACKS—MAKES TUBES LAST
MANY TIMES LONGER

Now, for the first time you can have complete control and adjustment of each amplifier tube merely by turning a simple knob. Do away with all jacks, plugs, rheostats and switches. The Amplitrol knob switches on the plate circuit and adjusts the filament circuit at the same time. You turn on any stage of amplification at will.

Lengthens the life of the tube from one-third to one-half, as it absolutely prevents suddenly throwing a heavy current onto the delicate filament. With the Amplitrol, the current is turned on GRADUALLY.

Genuine condensite, white graduations on a black dial, phosphor bronze contacts. Highest grade. Complete with wiring instructions, \$4.00.

If your dealer cannot supply you, don't make the mistake of accepting something "just as good." We will take care of your order direct.

KLOSNER IMPROVED APPARATUS CO.

Originators and Sole Manufacturers

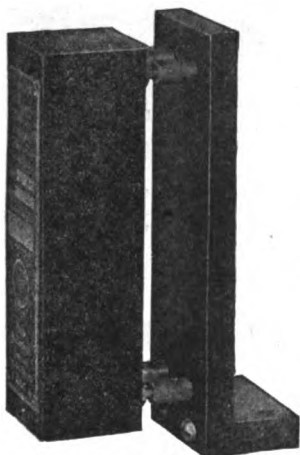
2024 BOSTON ROAD,

NEW YORK CITY

KLOSNER

TRANSATLANTIC TESTS

Will Succeed!



(Patents allowed)

DX R F Transformers Doing Record Breaking Work.

The DX-1 Radio Frequency Transformers will be used by European and American amateurs during Transatlantic Tests.

An Illinois amateur has a proven receiving range of over 4000 miles from short wave station in Hawaii. He hears broadcasting stations in 16 different states.

A 3rd district amateur recently picked up 66 200 meter C.W. and 7 spark stations in two hours time using DX Transformers. Cuban short wave phone station picked up with small coil aerial.

It Pays to Have the Best

**RADIO
INSTRUMENT COMPANY, INC.**
WASHINGTON, D. C.

(If your dealer cannot supply you, write us.)

AN HISTORICAL EPOCH IN RADIO RADIO PIONEER SLASHES PRICES

Leading Line Since 1909 - At Prices to You Less Than Dealers Costs

FREE illustrated pamphlet comprising sixty-two Duck radio instruments and sets, with reductions averaging 30%, mailed on request. Send postal today.

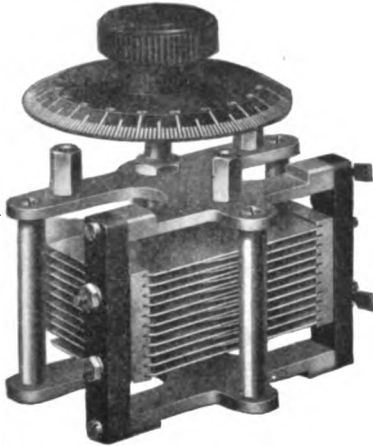
It was always the Duck policy to sell its own product direct,—from factory to consumer. We have decided to continue this policy and pass on to the consumer, in reductions averaging 30%, our entire complete line of radio instruments. These prices simply cannot be approached by any house. Our tremendous good will and low manufacturing overhead makes these unusual prices possible. This shall be our future policy. Get catalog out and observe the reductions and the quality of the goods.

A Few of the Many Duck Products at Startling Prices:

Duck Bakelite Dial, $\frac{1}{8}$ " or $\frac{1}{4}$ ".....	\$0.55	Duck "CQA" Three Stage Radio Frequency Amplifier in hinged mahogany cabinet..	\$49.00
Duck Positive Contact Socket.....	.70	Duck "RFQ" Two Stage Radio Frequency Amplifier, in hinged mahogany cabinet..	\$39.00
Duck Filament Rheostat.....	.70	Duck No. A204 Parts for Short Wave Receiving Set, in mahogany cabinet.....	39.00
Duck Radio Frequency Potentiometer.....	1.15	Duck No. A211 Parts for Short Wave Receiving Set.....	24.95
Duck Moulded Plate or Grid Variometer, less dial.....	4.65	Duck No. A212 Detector Panel.....	5.25
Duck Super-selective Mahogany Form Plate or Grid Variometer.....	3.60	Duck No. A213 One Step Amplifier Panel..	10.50
Duck Variocoupler.....	3.60	Duck No. A214 Two Step Amplifier Panel	27.00
Duck Switch Parts for Variocoupler, pigtail connections.....	1.25	Duck, The Original Arlington Receiving Transformer.....	9.75
Duck Panel Type 43 plate condenser.....	3.15	Duck Navy Type Receiving Transformer..	16.10
Duck Panel Type 23 plate condenser.....	2.50	Duck No. A220 One Step Radio Frequency Amplifier Panel.....	13.60
Duck Panel Type Vernier Condenser.....	1.65	Duck No. A221 Two Step Radio Frequency Amplifier Panel.....	28.00
Note:—Positively the very best variable condenser on the market. Pigtail connections; aluminum separators.		Duck No. 223 Three Step Radio Frequency Amplifier Panel.....	35.50
Tuned radio frequency receiving set, with one step radio and detector.....			29.75

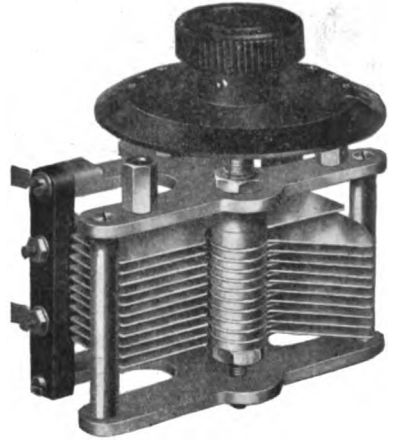
SEND 25c in coin or money order for Duck's combined radio catalog and text book No. 16, 256 pages. Continuously since 1909 the leading catalog. Replete with radio information and bookups.

The WILLIAM B. DUCK CO., 243-345 Superior St., Toledo, Ohio



An Innovation in Variable Condenser Design

Type 123-A
Variable Condenser
Patent Applied for



CARDWELL CONDENSERS are **GUARANTEED** superior to others of similar type in the following respects.

- 1.—**MECHANICAL CONSTRUCTION**—All metal frame. No insulated bushings—frame exceptionally rigid. Permanent alignment of plates.
- 2.—**ROTOR—ZERO POTENTIAL to FRAME**—"Body capacity" and leakage practically eliminated.
- 3.—**MINIMUM to MAXIMUM CAPACITY**—Greater range than any other of equal plate area.
- 4.—**DIELECTRIC**—Entirely outside the electrostatic field.
- 5.—**DIELECTRIC LOSS**—Reduced to the minimum. Less than $\frac{1}{4}$ square inch total area of contact between fixed plates and dielectric mounting strip.
- 6.—**ESPECIALLY DESIGNED** for **HIGH CLASS AMATEUR AND PROFESSIONAL** work.
- 7.—**EMINENTLY SUPERIOR** for **LOOP** sets.
- 8.—**ADAPTABILITY**—Condenser can be mounted on metal without bushings or on dielectric panel without changing capacity or increasing dielectric or leakage losses.
- 9.—**PRICE** \$4.75 less knob and dial or \$5.75 with knob and dial. A low price for a really superior instrument of .0005 mf. capacity.
- 10.—**IT'S A CARDWELL PRODUCT.**

If your dealer cannot supply you with **TYPE 123-A**
CARDWELL CONDENSERS, send your order to

THE ALLEN D. CARDWELL MFG. CORPORATION

81 PROSPECT STREET, BROOKLYN, N. Y.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

121



No. 57 Radio Frequency Receiver

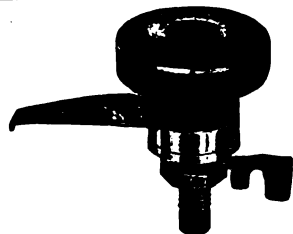
— go as far
as you like
WITH

Federal RADIO FREQUENCY AMPLIFYING APPARATUS

The FEDERAL NO. 57 RECEIVER combines simplicity and reliability of operation with a sensitiveness that is unrivaled, giving an extraordinarily high degree of amplification and making possible the reception of radio signals over marvelously great distances. It constitutes one stage of Radio Frequency, a detector and two stages of Audio Frequency.

Write for Bulletin No. 119-W

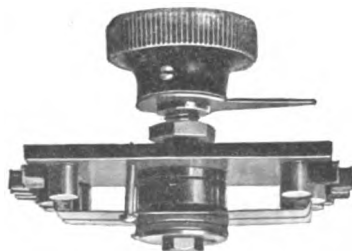
Federal Telephone and Telegraph Company
BUFFALO, N. Y.



#750
1 1/2" Blade 55¢
#752
1" Blade 55¢

DEALERS—

Send for our circulars and discount schedule of WIS-WIN Switches and other parts.



#784
Series-Parallel \$1.50 concealed type

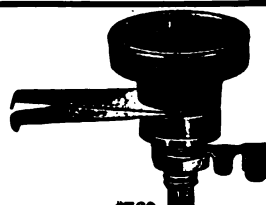
WIS-WIN Switches

For efficient operation of your set, use WIS-WIN switches, visible or concealed.

Visible types: (drilling templates furnished) Inductance switches, 6 styles. V-blade dead-end, 2 styles. Series-parallel.

Concealed types: (drill one hole to mount) Inductance, 6 contact. B-Battery, 6 contact. Series-parallel. 6 pole, double throw change over.

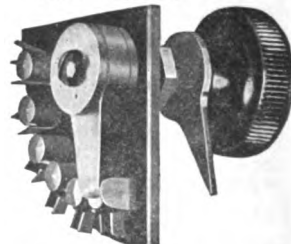
Ask your dealer for WIS-WIN switches. If he can't supply you, we will ship postpaid upon receipt of money order.



#760
1 1/2" Blade 65¢
#762
1" Blade 65¢

RADIO-ISTS

Send for circular giving data and prices on complete line of switches and other supplies.

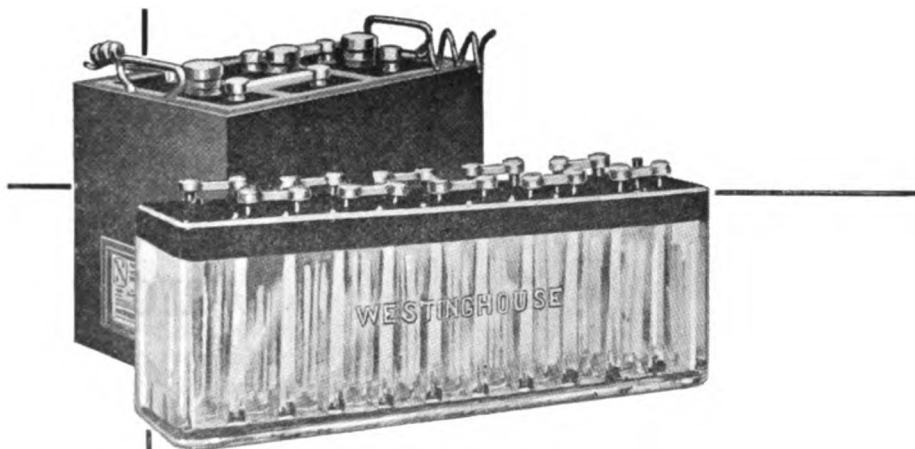


#756
6 contact Inductance \$1.25
#758
6 contact B-Battery \$1.25
Additional contacts 5¢ each

Willis Switch & Instrument Co.

8 Kingsbury Street,

Jamestown, N. Y.



Built by Westinghouse —you know they're *right*

Nothing about a radio set is so absolutely essential to satisfactory receiving as *right* batteries. Westinghouse Batteries are not only correct in design, but durable in construction and thoroughly dependable in performance.

WESTINGHOUSE "A" BATTERIES are full-capacity, low-voltage, slow-discharge, long-life batteries, built especially for radio work. Ten types—27 to 162 ampere hours' capacity; 4, 6 and 8 volts.

WESTINGHOUSE "B" BATTERIES. The new Westinghouse 22-MG-2 is a rechargeable 22-volt "B" battery and a marvel for steady, noiseless, full-powered service. Glass case; visible interior. Lasts indefinitely. Two other types.

*At your radio dealer's, or most any of the
2000 Westinghouse Battery Service Stations*

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

WESTINGHOUSE

RADIO "A" and "B" BATTERIES



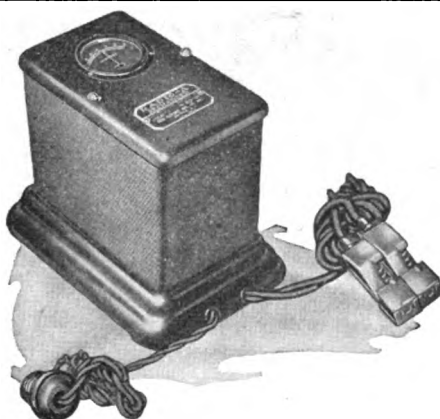
ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

Quality Design

+ Workmanship

+ Materials

- RELIABILITY



RADIO A RECHARGER

This unit is the product of a firm of pioneers in the battery charging field. Our commercial apparatus is used in thousands of the best equipped battery service stations in the country.

Materials and workmanship are the finest available.

RADIO "A" is built not assembled.

Simple to use—Just plug in at any 100 v. A.C. lamp socket—attach clips to battery—turn on current and

you have your own charging plant.

Only one moving part, which will last for several thousand hours.

The only Recharger with a *one piece* Removable Vibrator, can be replaced by a child.

Think of the convenience of not having to carry your battery to the



Service Station this winter.

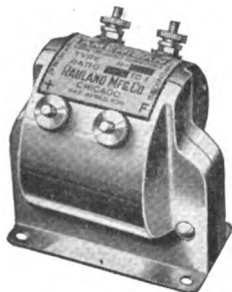
The Battery will always be full of pep.

A compact portable Recharging unit that will fully charge a 100 AH battery over night for 5¢ to 10¢.

A useful and lasting Xmas Gift. Lasts a lifetime.

KING ELECTRIC MANUFACTURING CO., INC.
1681 FILLMORE AVENUE,

BUFFALO, N. Y.



**To Strengthen Weak Signals
To Bring-in Distant Stations
To Get the Full Joy of Radio**

You will never know the full joy of Radio until you have hooked up to your set, a set of



"All-American" AMPLIFYING TRANSFORMERS (Radio and Audio Frequency)

Our Radio-frequency Transformer (Type R-10) brings in signals of 150 to 550 meter wave-lengths, and amplifies them many-fold, clear and sharp, largely eliminating static and other disturbances.

Our Audio Frequency Transformers amplify the detected signals, so that messages that would otherwise be audible only thru head-phones come in strong enough to be enjoyed by a roomful of people, thru a loud-speaker horn.

LIST PRICES

R-10—Radio Frequency (150-550 meters).....	\$4.50
R-12—Audio Frequency (Ratio 3 to 1).....	4.50
R-13—Audio Frequency (Ratio 10 to 1).....	4.75
R-21—Audio Frequency (Ratio 5 to 1).....	4.75

Send for Bulletin No. 22.



RAULAND MFG. Co.
35 So. Dearborn St., Chicago, Ill.



EISEMANN

THE advanced design of Eisemann radio units has met with instant favor wherever shown. The concave dial gives a mounting flush with panel. In appearance it is in marked contrast to the usual protruding knobs and dials. Another distinctive feature is the complete self-insulation of each part, making possible the use of a panel of wood, metal, or any other material.

Variometer

Both Rotor and Stator forms moulded of Bakelite. Extremely light in weight. Electrical losses reduced to a minimum.

Price each \$8.75



Variocoupler

The primary Tap Switch for tuning the antenna circuit is an integral part of the Variocoupler. No external switch, shielding, dial, or knob necessary.

Price each \$10.50

In addition to the units illustrated, other Eisemann products are Head phones, Vacuum Tube Sockets and Audio Frequency Transformers—all made to the highest electrical and mechanical standards.

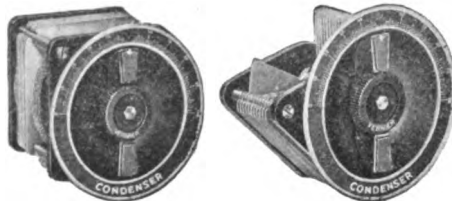
Variable Condenser

Balanced type

Rigidly constructed. Metal bearings front and rear. Rotary plates balanced, assuring constancy of setting. Vernier equipped.

Capacity .001 mfd.

Price each \$7.50



Variable Condenser

Unbalanced type

Aluminum plates accurately spaced eliminating any possibility of "shorts" between plates and assuring a more constant air gap. Vernier equipped.

Capacity .001 mfd.

Price each \$7.00

Capacity .0005 mfd.

Price each \$6.50

A combined Filament Rheostat and Potentiometer, with concave dial which conforms to the design of the parts illustrated, is now in course of preparation.

Write for Descriptive Folders.

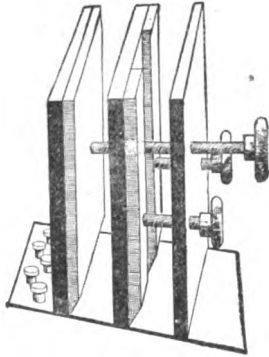
EISEMANN MAGNETO CORPORATION

William N. Shaw, President

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BROOKLYN, N. Y.

CHICAGO



Carillon

CONDENSERS — 2 in 1; 3 in 1 “The Charge Resides In The Dielectric”

Invaluable to Experimenters

The charge if provided with the best dielectric for its movement needs but a small amount of metal, and all metal in excess means loss in signal strength by the amount of loss in eddy currents and radiation on all edges and surfaces not acting in the field of the condenser.

This condenser was designed with the object of reducing losses in electrodes, providing a concentrated field to avoid exterior radiation and the securing of a slow variation of capacity with a fair manual effort.

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CARILLON INSTRUMENTS
Marblehead, Mass.

All novel features protected under patent pending claims.

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Complete Radio Directory
Contains
 United States Amateurs
 Special Amateurs
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 Canadian Experimentals and Colleges
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—Compiled annually from—
RADIO DISTRICT HEADQUARTERS
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Amateur Radio Call Book FIFTY CENTS Why Pay More

Contains all changes of address, Re-assigned Calls, Cancelled Calls—right up to date of issue—way ahead of any other Call Book at any price. Complete up to date Canadian list. Buy one, look it over, if it isn't the best you have ever seen, write us, money cheerfully refunded, at your dealer or direct from us. Postpaid.

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416 S. Dearborn Street, Chicago
Dealers, write for Guaranteed Sales Plan.

SPECIAL RADIO EQUIPMENT

Prices Quoted Upon Receipt of Specifications
Machine work and panel drilling. Plans and diagrams made for special receiving and transmitting sets.

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JOY-KELSEY CORPORATION

Manufacturers
RADIO EQUIPMENT
4021 West Kinzie St. Chicago Ill.



Claude L. Yates

The SANDMAN'S STORY

On a Tuska Radio Receiver, every evening you can hear "The Sandman's Story". This delights the children. Later comes entertaining Radio Broadcasting for grown-ups.

Tuska Radio will bring dependable broadcasting into your home, A Tuska Radio Receiver makes a wonderful Christmas Present.

Tuska Radio is substantial, reliable, dependable and recognized. Inspect today at your dealer's.

THE C. D. TUSKA COMPANY
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 Pacific Coast Office, 711 Mission Street, San Francisco, Calif.

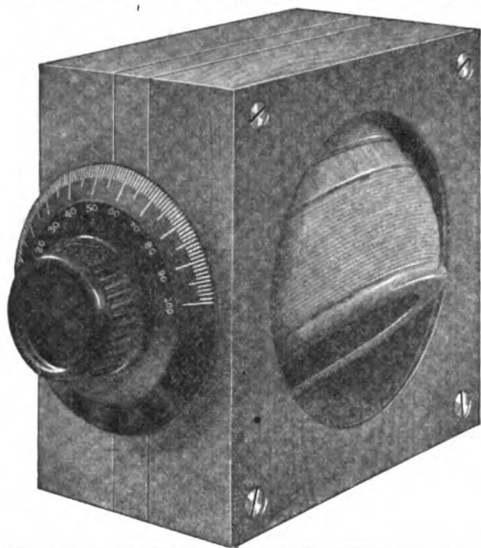


Catalog Number Four contains Marvelous article on tuning Receiving Sets 10 cents brings it to you

TUSKA RADIO

Established 1911

VARIOMETER-SPECIAL OFFER!



We have in stock upwards of 2,000 high-quality Variometers exactly like the illustration, which we desire to dispose of at the sacrifice price of

\$2.00

Without

Dial

These instruments have sold right along for \$6.00 and we offer this bargain to dispose of our stock for the reason that we have developed a Bakelite Variometer which will shortly appear on the market. This price is so low that we cannot afford to supply the dial which appears on the illustration.

The Variometer is made of African Mahogany and designed for wavelengths, 200-600 meters. The Rotor is boiled in paraffin and water proof. All windings are permanently fastened. A high-quality device in every way.

Sign coupon and send with cash or money order for any quantity desired while they last.

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P. O. Box 121, Sta. A.

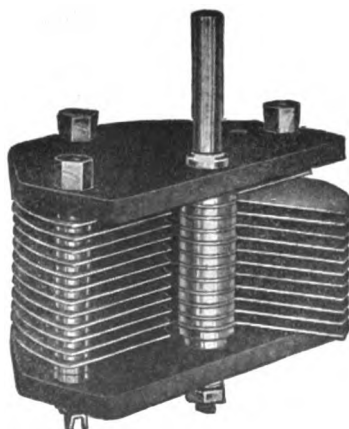
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EFFICIENCY

A Variable Condenser that is superior in electrical characteristics and mechanical ruggedness.

ELECTRICAL CHARACTERISTICS

Large insulating end plates cut from sheet insulating material which provides minimum dielectric losses. Perfect electrical contact.

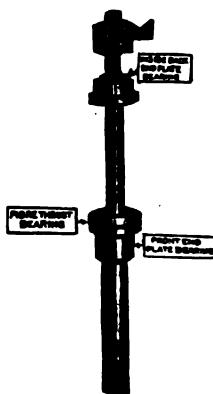
MECHANICAL FEATURES

Carefully fitted metal bearings on both ends of shaft. Adjustable Rotor Shaft Bearing.

Perfect alignment of parts. Remarkable smoothness of operation—ideal for tuning in CW reception circuits.

PRICES

3 Plate Vernier	\$2.00
11 Plate .00025 mfd.	3.15
23 Plate .0005 mfd.	3.50
43 Plate .001 mfd.	4.50



Shaft and Bearings used in MAXEPP Condensers

THE HIGGY-AVERY CO.,

1199-1205 Franklin Avenue, Columbus, Ohio

If your Radio Dealer cannot furnish you with "MAXEPP" Condensers send us your order with remittance and we will supply you postpaid.

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An interesting profession that takes you to all parts of world. Prepare through a school with a reputation for efficiency. Arc, spark and tube. Day and evening classes. Positions guaranteed.

Send 10 cents in stamps for catalog.

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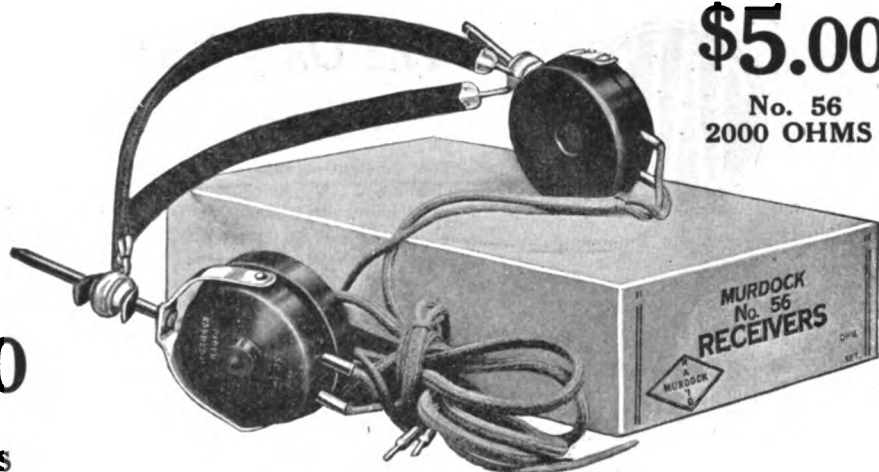
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- 1—"International" Motor Generator 525 Volt 40.00
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THE RICHMOND PALLADIUM
RICHMOND, INDIANA

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**No. 56
3000 OHMS**



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2000 OHMS**

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Seventeen years ago you could have given Murdock Phones as Christmas gifts.

You can do so this year with the absolute assurance that any radio enthusiast will be mightily pleased to receive a genuine Murdock Headset for Christmas.

You well know how essential extra head phones are when friends come round to "listen in"—so fix up your friends with an extra set for a Christmas gift, and get a set for yourself.

SOLD BY DEALERS EVERYWHERE

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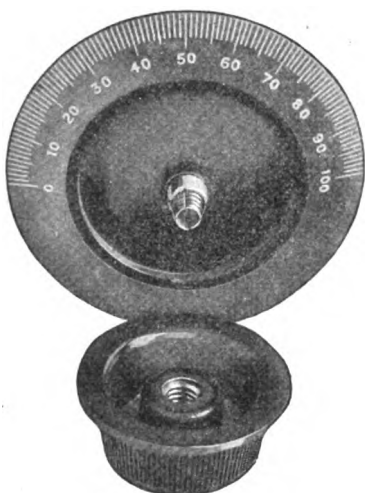
Chelsea, Mass.
509 Mission St.
San Francisco

MURDOCK PHONES

STANDARD APPARATUS SINCE 1904

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

129



Patented June 20, 1922

The Only Knob and Dial Without a Set-screw

The unsightly and troublesome SET-SCREW is at last eliminated. No more splitting the head of the set-screw or stripping of threads, perhaps ruining the dial.

To mount the TAIT-KNOB-AND-DIAL simply hold the dial with one hand and screw on the knob with the other; a few seconds does it. No tools are necessary. When fastened it is self centering and self aligning.

This beautiful patterned KNOB-AND-DIAL is made of the best grade of Bakelite.

To those building their own sets—Don't fail to use this dial. It is REVOLUTIONARY in its field and is the PEER of all KNOBS-AND-DIALS. If your dealer has none write

us, and we will refer you to one who has.

Dealers—If your Jobber is not stocked up write us and we will refer you likewise.

Price—3"\$1.00
Price—4"\$1.50

We Sell Strictly to Manufacturers and Jobbers—whom we invite to write us for samples and discounts.

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Incorporated

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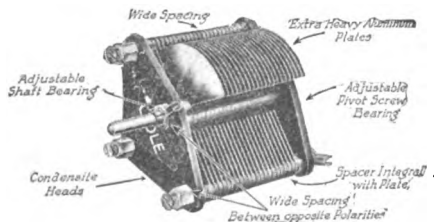
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Why Cole Condensers Are Better!

Spacers integral with Stator Plates

THE spacer and the stator plate are all one in Cole Variable Condensers. Stator and rotor plates are equi-distant at every point on the dial to the half-thousandth of an inch. No chance for buckling, or loosening. Just one of many exclusive features of marked superiority. Made by well-known radio manufacturers of 17 years experience. Laboratory tested. Write today for interesting circular.

A. B. COLE, Inc.
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Loud Speaker \$1

Adapter
Hear all broad-casting through phonograph. Make your own horn. Attach B-R Phonadapter to YOUR phonograph. All can hear. Entire family, neighbors, guests can hear operas, lectures, latest news, with this adapter. Stretches over receiver of Baldwin or Brandes type head-set and attaches to tone-arm of ANY phonograph. Made of soft, pure gum rubber. Quickly attached and removed. Thousands in use. Absolutely no voice distortion. For single receiver.....\$1.75
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An inexpensive, loud speaking horn especially adapted for home use. Ample volume. Quality tones. Throat of horn consists of successive sound expansion chambers. Each chamber amplifies previous one. Furnished either with single or double B-R Phonadapter. Price \$8 only.....

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A Bell Horn with ball swivel. Turns up, down, to side—any angle desired. Automatic adjustment. Very simple. No screws, thumb nuts, etc. Black finish. Complete, with phone, ready to attach to two \$15 stage amplifier.....

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Go to your dealer. If he cannot supply you send money order, check or currency at our risk. Prompt delivery—postpaid. Also send us name of favorite dealer.



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The fun and entertainment that you and your friends get from Radio should never be marred by failure of your apparatus to properly do its part—and it won't fail if it is properly made.

The Radio "fans" of today will be the Radio experts of the future—*provided* the equipment used *now* gives service and satisfaction. If you are interested—much or little—in Radio, don't let inefficient equipment discourage you. Insist on SIGNAL parts and SIGNAL sets.

Every SIGNAL item is made in a factory that has grown up with "wireless." One of the earliest manufacturers of such equipment, SIGNAL offers you, now, Radio parts and Radio Sets that are *right*, and are *dependable*. To insure getting all there is—to be confident that nothing goes by you without your consent—say SIGNAL, and stick to it, when you buy equipment of any kind.

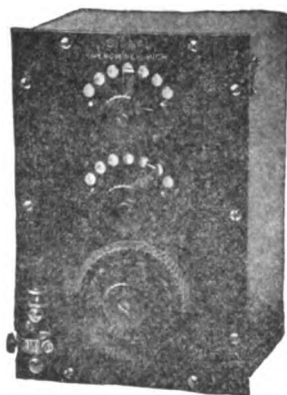
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You'll find our local address in your Telephone
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(1922)



Signal Units

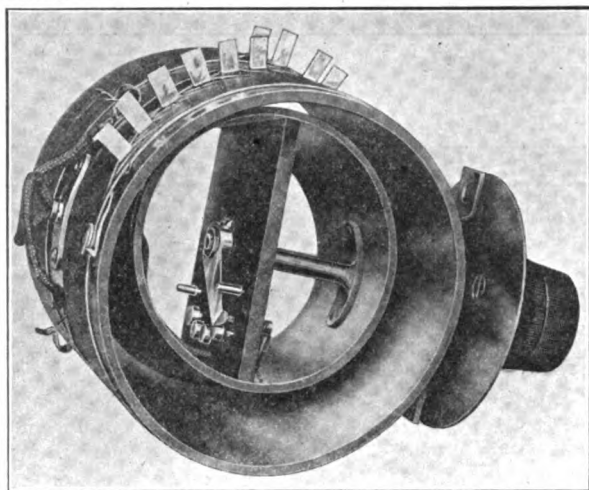
For the amateur, and also the rapidly growing commercial field, we have developed an entirely new line of apparatus, in which is incorporated the very latest advancement of the science of Radio.

Each individual unit is primarily a separate and distinct device, complete in itself, yet by adding one to another any combination may be obtained, from the simple crystal detector through all the stages of radio-frequency and audio-frequency amplification.

Seasoned knowledge and experienced handicraft are built into these units—the product of a plant and an organization whose history in Radio dates back to the earliest days of "wireless."

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Variocoupler. The In-
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Will Please You.

Windings—Green Silk Wire
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*The Newest Book on
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INCREASING RADIO EFFICIENCY

Through

SUPER-REGENERATION

REVISED EDITION

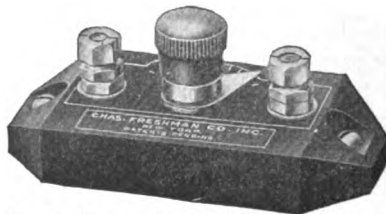
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Variable Grid Leak and Micon Condenser

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Obtainable in an unbroken range
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Lest you forget!

The Acme Apparatus Company

makes both RECEIVING and TRANSMITTING apparatus

SO RAPID have been the strides of radio in the past year, so popular has the demand for radio supplies become, so many and different types of apparatus have been hastily thrown upon the market that today even the experienced amateur is occasionally at sea in making a choice of his apparatus.

The Way to Choose

OUT of this fog of conflicting claims of untried and unknown products it is wise to be guided by the compass of past experience. Concerns like the Acme Apparatus Company who have weathered the storms of many a lean and trying year without deviating one iota from their standards of careful painstaking production are those upon whom

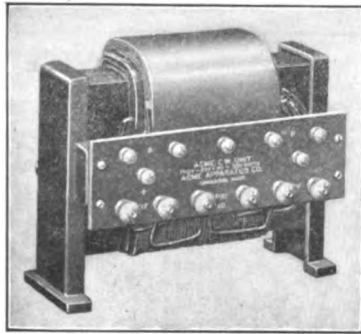
you should pin your faith. You can rely upon their products because of their good name. They have kept faith.

Other Acme Products

THE Acme Apparatus Company in addition to their line of RADIO and AUDIO frequency transformers are also manufacturers of amplifying units. In addition remember that they are still the FOREMOST manufacturers of C.W. transmitting apparatus of all kinds.

Reliable radio or electrical dealers

stock Acme Radio Apparatus or can get it for you at twenty-four hours notice. The Acme Apparatus Company, Cambridge, Mass., U.S.A. New York Sales Office 1270 Broadway. Send for Bulletin T.



Acme C.W. Power Transformer
Price \$20.00 East of Rocky Mts.

ACME

for amplification
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AMATEURS



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VARIOCOUPLER
150 TO 600
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20% DISCOUNT



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WHO WILL SEND A COMPLETE LIST
OF ALL RADIO AND ELECTRICAL
DEALERS—THE LIST MUST BE**

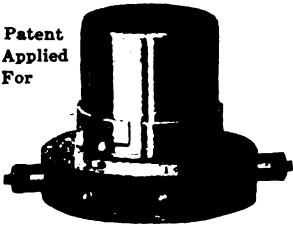
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STAMPS. THIS CATALOGUE WILL ENABLE YOU TO BUILD A COMPLETE
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A handsome, efficient unit, of the high Rhamestine[★] standard

The bayonet mounting allows changes of transformer instantly for the other wave lengths, without disturbing base or wiring.

The type 1 R.F. Transformer, with its range of 200 to 500 meters, gives best results with the present broadcasting wave lengths.

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We are an old established firm being in the radio game several years, and our reputation is long known as giving our customers prompt, intelligent and satisfactory attention to all orders. Try Us and See.

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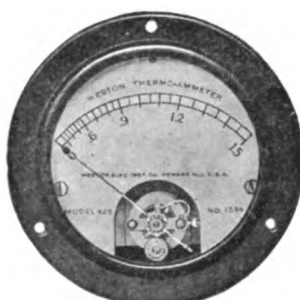
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There is a Weston Indicating Instrument to meet every Radio need whether it be for Reception or Transmission. Voltmeters, Ammeters, Milliammeters, Thermo-Ammeters and Thermo-Galvanometers, in low or high range or in small or large size are available for the amateur, advanced experimenter or commercial station. Whatever your special requirement or problem may be, get in touch with us and let us send you full particulars and prices on the instrument or instruments exactly suitable to your needs. Weston 280 Volt-Ammeter is also specially designed for testing tube characteristics, general circuit conditions, for measuring resistance, filament voltage, plate voltage, etc.

Booklet J, and other Radio literature describes and illustrates these various Weston instruments. Everyone interested in Radio should have this important data. Write for it to-day.

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Warren Head Sets



*Specialists in Head Sets
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The WARREN

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Our phones are scientifically designed by our Engineer who has made telephony a study for the past twenty-two years.

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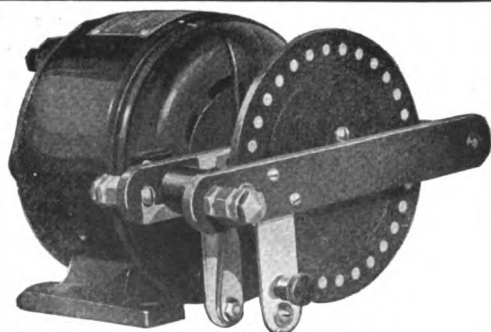
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Patent Applied for

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BUY IT IN CARTONS

RADIO

FOR BETTER RESULTS USE

EVEREADY

"A" and "B" BATTERIES
WITH YOUR RADIO SET

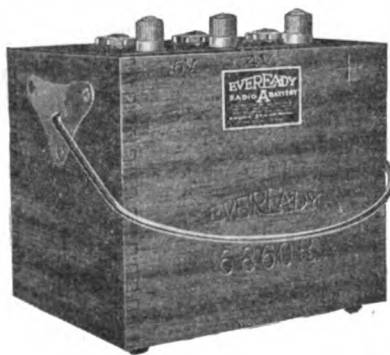
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No. 6810 50 Amp. Hrs. \$15.00
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No. 6880 110 Amp. Hrs. 20.00

—Hardwood Box, Mahogany Finish
—Convenient Handle, Nickel Plated
—Rubber Feet, Protect the Table

No Accidental Short-Circuits

All Eveready "A" batteries are equipped with a 4 volt as well as a 6 volt terminal, making it possible to use either 6 volt or 4 volt vacuum tubes in your set



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No. 766—15 Cells—16½ to 22½ Volts
(1½ Volt Steps) \$3.00

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No. 767—30 Cells—16½ to 22½ Volts
(1½ Volt Steps) with a 45 Volt Tap
for the Amplifier Tubes . . . \$5.50

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Guaranteed to be Absolutely Noiseless

Columbia Ignitor Six-Inch Dry Cells Equipped with Fahnestock Connectors

Columbia Dry Cells are suitable for the filament or "A" circuit of Westinghouse WD-11 Vacuum Tubes, which require one six-inch dry cell per tube

Visit our Exhibit, RADIO SHOW Space 56, Grand Central Palace, New York

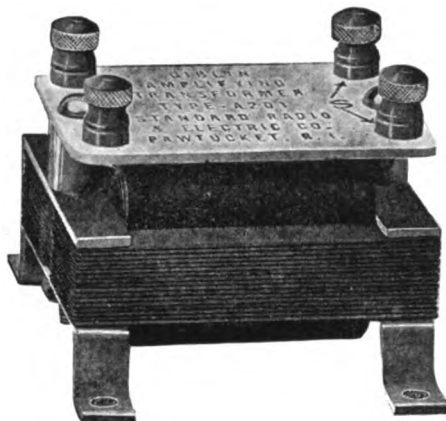
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ARE YOU FROM MISSOURI?

Mounted
\$4.50



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\$3.50

In one month this Transformer has received approval from Maine to California

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GIBLIN AUDIO FREQUENCY AMPLIFYING TRANSFORMER

Designed for use with standard amplifying tubes. Maximum amplification without noise or distortion.

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—AND—

How to Construct and Operate a Honeycomb Coil Set, Detector and Two Step Amplifier.

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Order from your dealer—If your dealer hasn't them, send direct.

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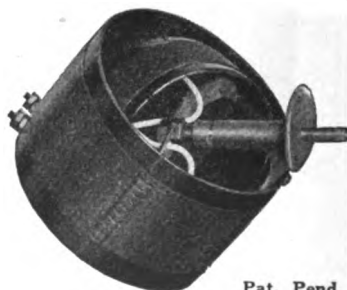
Radio Directory & Publishing Co.

45E VESEY STREET, NEW YORK, N. Y.
138

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LORAIN

The Coupler with the
PERFECT MOUNTING



A coupler which is fast proving its superiority. A coupler designed to work correctly and give lasting satisfaction. Accept no substitute.

Price \$5.50

Send for complete description. Circular C.2.

If your dealer cannot supply you write us and send his name. Dealers write for discounts.

Lorain Radio Supply Co.
LORAIN, OHIO



Hear it Loud and Clear-Toned!—

THE most expensive set—the best circuit, the newest apparatus carefully tuned, will not give maximum results unless your receivers are good. "Red-Heads" in the seven years they've been on the market have met every critical test of Radio. Designed by radio engineers. They are sensitive. They are accurately made. They are durable and will hold their sensitiveness.

At the new low price of \$6.50 they are without a doubt today's biggest value in high-grade Radio Receivers. You take no risk when you buy "Red Heads". Send the coupon today—

3000 ohms Complete with military head-band and cord.

The Newman-Stern Co

Newman-Stern Building

CLEVELAND, OHIO

Also producers of "NAA" Arlington Tested Detector Crystals and Teagle Line of better radio apparatus. Send for descriptive bulletins.

\$NOW
6⁵⁰

At your dealer's or sent direct on receipt of price.
THE NEWMAN-STERM CO., Cleveland, O.

Gentlemen:—Enclosed is Money Order for \$6.50 for which please send me a pair of "Red-Head" Receivers. It is understood that if I am not completely satisfied with these 'phones, I may return them within seven days and get my money back.

Name _____

Post Office Address _____

The name of my dealer is _____

RADIO "A" & "B" STORAGE BATTERIES ^{CHARGED} AT HOME **F-F RADIO RECTIFIER**

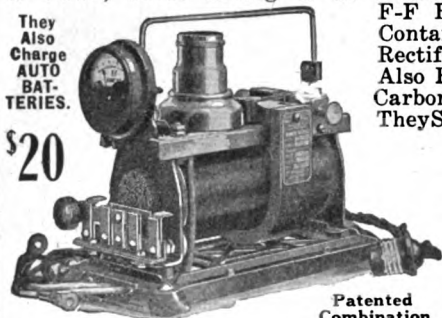
FOR A FEW CENTS, FROM ANY 100 to 130

Volt 60 Cycle LAMP SOCKET, WITH AN

It Charges All 6 Volt RADIO "A" & AUTO Batteries; & RADIO "B" Storage Batteries Up to 120 Volts, In Series Inductively. Disconnecting Unnecessary. Nothing to Slop over, Burn Out, or cause trouble and It Will Charge a Dead Battery. They Charge Automatically, Operating Unattended. Leave Battery wherever it is, without even disconnecting it; Screw Plug in Lamp Socket, Snap Clips on Battery Terminals; Turn Switch & Battery will be Charged in the morning. Is it not gratifying to feel that Your Radio Batteries will never fail & You are always Ready to Receive **RADIOPHONE** Broadcast Music, Sermons & News; never having to be careful of or to tell Friends Your Batteries are dead?

They
Also
Charge
AUTO
BAT-
TERIES.

\$20



Patented
Combination

F-F BATTERY BOOSTERS are Complete Compact Self Contained Portably Handy Full Wave Automatic Magnetic Rectifying Charging Units, for 100 to 130 Volt 60 Cycle A.C. Also For Other Cycles. No Skill is Required. **INFUSIBLE** Carbon Rectifying Brushes Maintain Uninterrupted Service. They Save More Than They Cost & Last Lifetime. **POPULAR PRICES:**

Type 6 for 6 Volt "A" Battery, Charging at 6 Amperes \$15

Type B Charges Radio "B" Batteries Up to 120 Volts \$15

Type "A-B" Combination Radio Rectifier for

Charging 6 Volt "A" & Auto Storage Batteries & Up

to 120 Volts of "B" Storage Battery In Series \$20

Type 12 for 12 Volt Battery, Charging at 5 Amperes \$15

Type 166 for 6 Volt Battery, Charging at 12 Amperes \$20

Type 1612 Charges 12 volt Battery at 7 amperes \$20

Type 1626 is a Combination of Both Type 166 & 1612 \$28

Even though you will buy an F-F Rectifier. Why Not Now? It Costs You Less To Buy a Booster Than To Be Without One. All Types But B charge Auto Batteries. The Larger Types are for heavy Batteries, or Where Time is limited. Shipping Weights Complete With **AMMETER** & **BATTERY CLIPS** 11 to 15 lbs. Purchase from Dealer, or Mail Check for Prompt Shipment. If via Parcel Post add Postage & Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge Batteries from Farm Lighting Plants & D.C. Circuits & For **GROUP CHARGING** use our 12 Battery 8 Ampere Full Wave Automatic **ROTARY** Rectifier described in **FREE Bulletin No. 31A**. **ORDER** Now or **WRITE** Immediately for **FREE BOOSTER Bulletin No. 31**.

THE FRANCE MANUFACTURING COMPANY **OFFICES & WORKS**

Canadian Representative: Battery Service & Sales Co., Hamilton, Ontario, Canada.



2000 ohm
Head Sets

\$5.50

3000 ohm
Head Sets

\$6.50

**"When You Listen in With
ELWOOD, You Get it ALL"**

Get all that's coming. Get it clear and distinct, even under interference conditions which prevent other listeners with other than Elwood Head Sets from getting it as you do.

Try an "Elwood." You'll never be wirelessly happy until you're using one.

2000 ohm sets \$5.50, 3000 ohm sets \$6.50. Send your order to us if you cannot be supplied by your dealer. Above prices will include delivery.

ELWOOD ELECTRIC CO. INC.

2 Randall Ave., Bridgeport, Conn.

SIMPLEX—that's your safeguard



VARIO-COUPLER PANEL



VARIOMETER PANEL



DETECTOR PANEL



AMPLIFIER PANEL

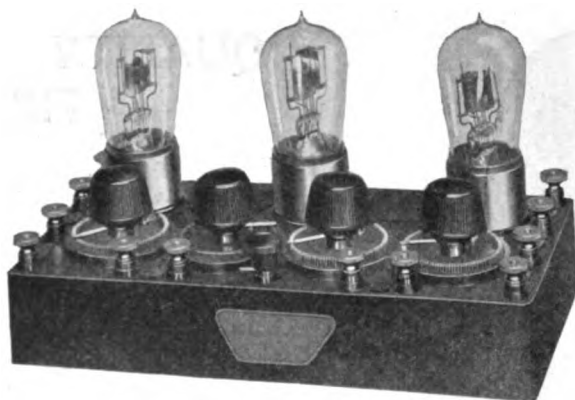
Also Unmounted Variometers & Variocouplers

Simplex Panel Units make it possible to try out many different hook-ups without disassembling panels. These highly perfected units eliminate much of the uncertainty of success in receiving radio broadcasts because they have been designed by men having years of experience in radio activities. Get them from your dealer.

SIMPLEX RADIO CO.

1013-15 RIDGE AVE.,

PHILA., PA.



Just What the Readers of QST have been hoping for

—a simple, more practical, more dependable, more efficient detector-amplifier—and it's *visible*.

Compact—only 5 x 10 inches, no awkward box or cabinet.

Pure toned—all conductors are extremely short, and so arranged as to avoid the customary local capacity effects.

Powerful—contains two of the celebrated BETTS audio frequency transformers, demonstrated to be most powerful and free from distortion.

Durable—a solid block of Bakelite, rugged in construction to withstand long use, and fool-proof against rough handling.

Selective—separate controls for each tube and has improved potentiometer for fine tuning.

Complete—fully wired and ready to connect into any circuit, embodies every known essential to perfect detection and two-stage audio frequency amplification. Has cut-off switch for the A battery.

Adaptable—used with any tuner or tuning circuit from the simplest coupler to the highest type of regenerative or super-regenerative hook-up; simple to connect, always giving superior signals.

Simple—being designed for straight 2-stage amplification, it eliminates the intricate wiring, troublesome switches and jacks, and many possibilities of loose contacts found in *all* amplifiers wired for intra-stage connections.

Visible—all tubes in full view, where their operation and condition may be always seen without “peeping through a knot-hole” or “lifting the lid.”

Fine looking—its Bakelite base, polished nickel fittings, improved design knobs, and all details make it look like what it is—a really FINE instrument.

The retail price of the Betts Visible Type D2A is \$38.50. Orders by mail will be handled in the order of their receipt, being referred to dealers for immediate delivery in territories where dealers are now supplied, or being shipped prepaid direct in territories where dealers are not yet supplied.

BETTS & BETTS
CORPORATION

600 W. 43d Street, New York

595 Mission St.
San Francisco

227 W. Randolph St.
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1415 Pine Street
St. Louis

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QUALITY FIRST

The Roller-Smith loud speaker comprises two special receivers built **permanently** into a heavy cast aluminum horn. By matching the receivers as a pair and the pair to the horn we attain the quality of reproduction which characterizes a fine phone, combined with volume sufficient for any average room.

You will be surprised to hear the difference between it and the raucous shouter type or it and the fish horn squawker.

No batteries required.

Handsome black crystalline enamel finish.

Price, but eighteen dollars.

Send for Bulletin No. AG-20.

ROLLER-SMITH COMPANY
Electrical Instruments, Meters and Circuit Breakers

MAIN OFFICE:
16 Park Place, NEW YORK

WORKS:
BETHLEHEM, PA.

Offices in principal cities in United States and Canada.

*Eventually you will
buy better apparatus—*

The AMERTRAN

**super audio frequency
amplifying transformer**

WHEN a man interests himself in any hobby, such as photography, automobiles, or what not, he usually starts in by buying cheap, crude equipment. Immediately he begins to realize that he wants better equipment, more skillfully designed apparatus.

It is the same with radio. Profit by your own experience in other matters and decide now that you will not be so handicapped.

The AMERTRAN has the greatest amplification (38.6 in one stage with Radiotrons)* and is without distortion over the whole range of audio frequencies.

*Send for leaflet #975.

Price \$7

*Ask your Electrical Dealer, or sent
carriage charges collect (Wt. 1 lb.)*

American Transformer Company

*Designers and builders of radio
transformers for over 20 years.*

176 Emmet St., Newark, N. J.



IN making itself undisputed leader in New England, our school has become prominent *nationally*.

If you contemplate training for a Commercial License, it is an important first step to write at once for our latest catalog.

Students may enter at any time.

**MASSACHUSETTS RADIO and
TELEGRAPH SCHOOL, Inc.**
18 Boylston St. Boston, Mass.

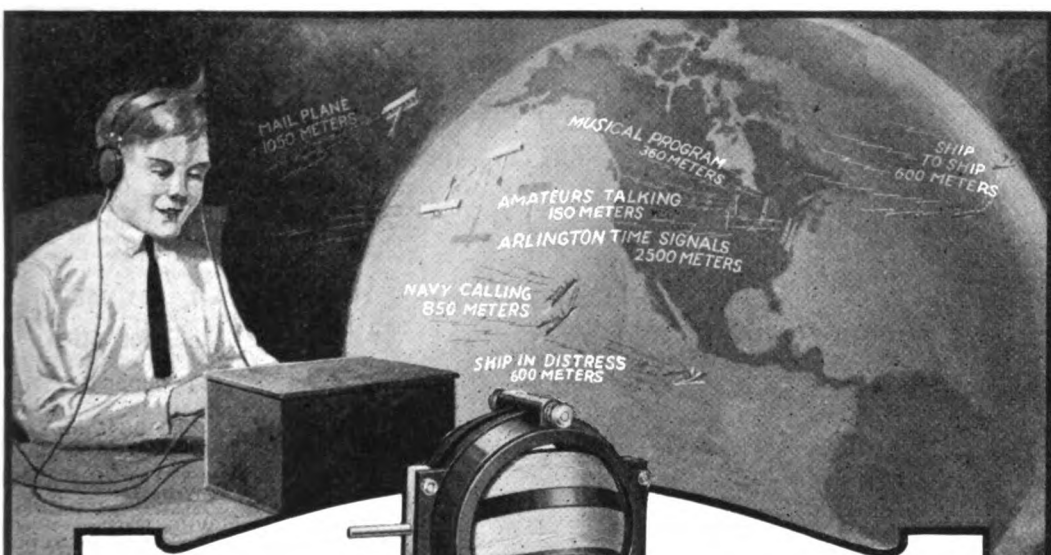
Formerly Boston School of Telegraphy, Est. 1908

G. R. ENTWISTLE

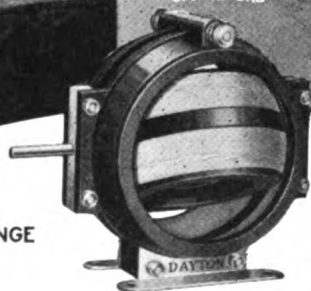
Radio Director

R. F. TROP

Telegraph Director



LISTEN IN
ON THE WHOLE RANGE



WITH A BACK WOUND
DAYFAN VARIOMETER

The World Is Getting Smaller Every Day

DAY-FAN Variometers and Variocouplers make the world still smaller with their exceptional *range* of wave lengths.

Assemble your own sets with DAY-FAN Radio apparatus, so you can change the arrangement as needed to meet the developments that are bound to come.

Write for Complete Catalogue, free, and mention dealer's name and address.

The Dayton Fan and Motor Company

Factory and General Offices

602 Day-Fan Block, Dayton, Ohio

Established 1889



THIS TRADE MARK
APPEARS ON



ALL DAYFAN RADIO
APPARATUS



POSACO RADIO

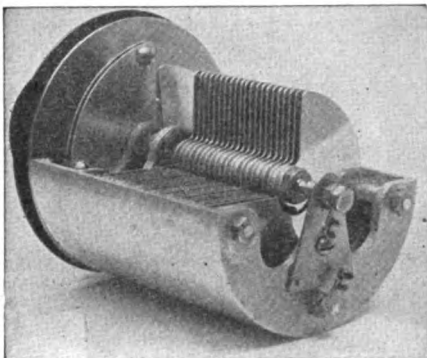
QUALITY AND EFFICIENCY

VERNIER CONDENSER WITH SINGLE KNOB CONTROL

Especially Adapted to the New Armstrong Super - Regenerative Circuits in which Variable Condensers Play an Important Part and in which fine adjustments are Absolutely Essential.

- B-1 .001015 MFD. \$7.50
 B-2 .000545 MFD. \$7.00
 B-3 .000295 MFD. \$6.50

Constructed With the Same High Standard of Quality in Materials, Workmanship and Design As Our Regular Variable.



NEW MODEL. Improved Construction and Design. Gives Maximum Rigidity, Thus Insuring Permanence of Alignment and High Efficiency in Operation.

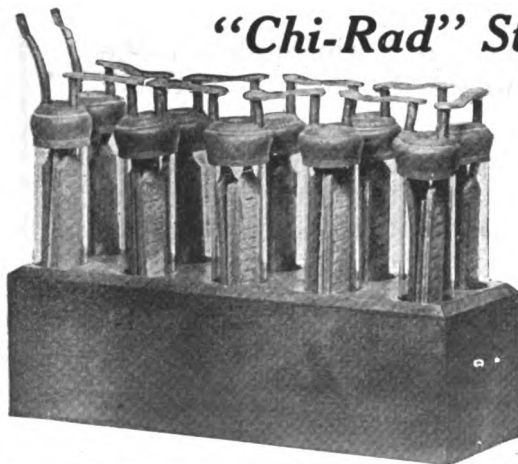
- A-1 .001 MFD. \$4.50
 A-2 .0005 MFD. \$4.00
 A-3 .00025 MFD. \$3.50
 A-4 .000045 MFD. \$3.00

Ask Your Dealer or Write for Circular. Jobbers and Dealers Write for Proposition Increase Your Sales

—MANUFACTURED BY— Alden L. McMurtry, Licensee

THE C. D. POTTER CO., Stamford, Connecticut

POSACO RADIO



"Chi-Rad" Storage "B" Battery

built for service. Absolutely unequalled in quality and price—half the cost of the cheapest well-made storage "B" battery. Better and cheaper than dry cell "B" batteries because rechargeable.

Will operate a tube approximately 1,000 hours on a single charge. Recharged over night with "Chi-Rad" Storage "B" Battery Charger at a cost of about 5¢.

No noises or leakage losses with "Chi-Rad" Storage "B" Batteries. Guaranteed for service, or to be returned at our expense. Order your battery NOW.

- No. 110 "Chi-Rad" Storage "B" Battery
 22 volt section (mounted) \$6.00
 2.2 volt section (single cell) .50
 No. 110a "Chi-Rad" Storage "B" Battery
 tery Charger 1.90
 (Order by number)

Write for your free copy of our new catalog

Dealers: write for territory on "Chi-Rad" radio parts and sets,—the demand's increasing steadily.

Chicago Radio Apparatus Co.

415 S. Dearborn Street,

Chicago

\$13⁶⁰ That's All for a Willard "A" Battery

Here's a Christmas present that will go big, you can be sure—with yourself or anyone else who has a radio set.

It's a genuine Willard "A" Radio Storage Battery at the lowest price for which a Willard Radio "A" Battery has ever been sold.

And when we say genuine Willard we mean just that, for this new battery is fit in every detail to bear the name. We are no less proud of producing such a good battery to sell at such a low price than of being the makers of the popular Willard All-Rubber Radio Batteries, the last word in radio battery construction.

Why This is a Real Willard

It is made in the same plant and by the same men who make the higher-priced Willard batteries for both radio and automobile service, and with the same care, skill and experience.

It has Willard quality plates, selected wood separators, tested rubber jars, acid-proofed container.

It includes such features as special terminals to insure easily-made and tight connections; special marking for positive terminal; patented rubber gaskets to prevent leakage; a convenient durable roller-type handle, and other advantages.

All Willard Radio Batteries, too, are shipped from the factory dry and fully charged, so that you always get a brand new battery ready for use just as soon as the acid solution is poured in to it.

Go to the nearest Willard Service Station or your dealer's today and see this new Willard Battery.

WILLARD STORAGE BATTERY CO.
Cleveland, Ohio

Made in Canada by the
Willard Storage Battery Co. of Canada, Ltd., Toronto, Ont.



It's Made in 3 Sizes!

This new battery—the Willard FW—is of the 6-volt type and made in three sizes, 40, 80 and 110 ampere hour capacity. They are priced as follows: 40 a. h., \$13.60; 80 a. h., \$17.50; 100 a. h., \$22.00. A slight addition to these prices is made in the extreme south and west of the Mississippi.

Willard STORAGE BATTERY

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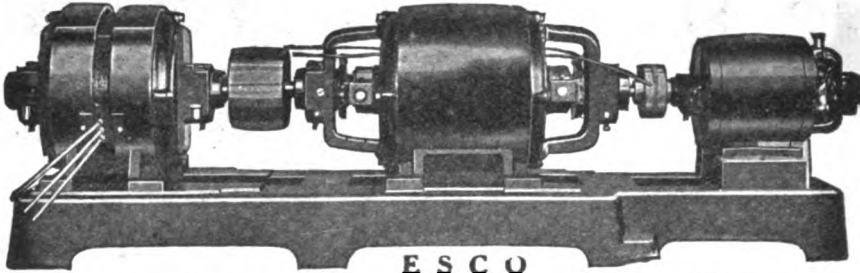
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ESCO

TRADE

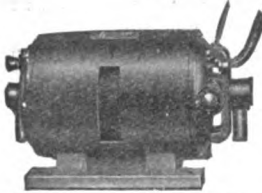
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QUALITY ALWAYS HAS BEEN, AND ALWAYS WILL BE, THE WORLD'S SAFEST INVESTMENT

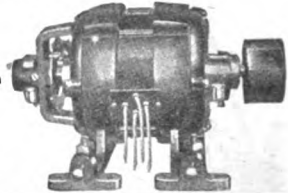


ESCO

HIGH VOLTAGE MOTOR-GENERATORS STAND PRE-EMINENT
Used by Leading Educational Institutions, U. S. Army and Navy Academies, Research Laboratories,
Newspapers, Dept. Stores and Broadcasting Stations.
BULLETIN 237 LISTS OVER 200 COMBINATIONS
Special Apparatus Developed for Special Requirements
MOTORS—DYNAMOTORS—GENERATORS—MOTOR-GENERATORS
Sold by Principal Dealers Everywhere



Electric Specialty Co.
215 South Street
Stamford, Conn., U.S.A.



\$5.00



\$7.50

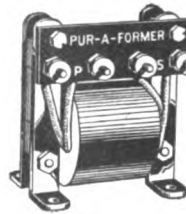
For perfect reception there is no phone like the "Royal-fone" King of All at either \$5.00 or \$7.50. Either phone will make an appreciated Christmas gift, something that anyone will cherish for a long time.

A "Royalfone" is a satisfied gift because it is guaranteed.

We will take care of you if there is no dealer in your vicinity.

ROYAL ELECTRICAL LABORATORIES
207 Market St., Newark, N. J.

Royalfone



PUR-A-FORMER
\$350

Here's an audio amplifying transformer without any frills or fancy finishes—just solid honest value. The PUR-A-FORMER is compact and strongly built—amplifies without howl or distortion. Takes minimum space in your set and will produce results equal to many selling at double the price. Winding ratio $4\frac{1}{2}$ to 1. Buy them at all good dealers.

HARRY ALTER & CO.

We Sell Wholesale Only

126 NO. MAY STREET, CHICAGO, ILL.

DEALERS ONLY—

Write for Harry Alter's RADIO "POCKET-BOOK." A net price catalog of radio supplies published each month. Our wholesale prices hit bottom. The RADIO "POCKETBOOK" sent free to dealers only. Use your letterhead.

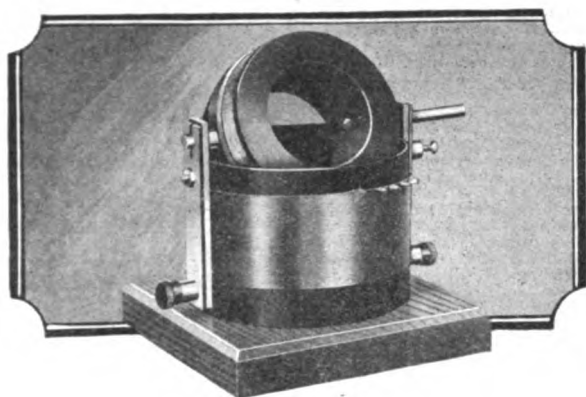
HARRY ALTER & CO.

126 No. May Street, Chicago

We Sell To Dealers Only

Thoro-bred

RADIO PRODUCTS



How to tune-in without the "birdies"

HISSING, sizzling and similar noises have been such a common experience of the radio amateur while tuning in that they have been nicknamed the "birdies." This nuisance can be eliminated. The Thoro-bred Vario-Coupler in addition to the usual services has the added feature of tuning in so closely that the "birdies" are driven away. Ordinary vario-couplers have a tap brought out for connection purposes only at every six or seven turns of the primary. The Thoro-bred Vario-Coupler has each of the first seven turns tapped one turn at a time and the balance of the primary tapped every seven turns. This close-tuning feature scares the "birdies" away. It also saves you the expense of a variable condenser.

Each tap on the primary has a 3" lead insulated with cambric tubing. This permits making connections to contacts without using soldering iron. There is a directly positive connection to the secondary which eliminates all scratchy noises when in operation.

The Thoro-bred Vario-Coupler is molded. It is not subject to moisture as are the common wooden types. Distributive capacity is eliminated through the use of special green silk wire in both the primary and secondary. *For only five dollars* you can now buy the Thoro-bred Vario-Coupler from your nearest radio or electrical store. If for some reason your dealer cannot supply you, send the money direct and a Thoro-bred Vario-Coupler will be mailed you parcel post prepaid.

THE MARSHALL-GERKEN CO.
Toledo, Ohio, U.S.A.

THE MARSHALL-GERKEN CO.
Toledo, Ohio, U.S.A.

My dealer was unable to supply me with a Thoro-bred Vario-Coupler. Please send me one parcel post prepaid. I enclose five dollars.

Name..... City.....

Street..... Dealer's Name.....

BUILD YOUR OWN RADIO

The Radio Specialty Company—RASCO for short—specializes in small orders; in fact, 50% of our orders are less than one dollar. 24-hour service guaranteed.

This Company specializes in small parts for radio, selling only the highest class of materials. This Company is aware of the fact that very high prices prevail in radio now. By buying material from us you not only save anywhere from 50 to 75% on the cost of the instruments, but you have the fun and instruction of making them yourself.

Our quick, 24-hour service means satisfied customers. We have no Complaint Department. Hundreds of letters such as the following, unsolicited, are in our files:

41 Rodney St., W. St. John, N.B.

Dear Sirs:

Enclosed you will find one (1) dollar for which please send me 1 dozen binding posts No. 201 at \$1.00 per dozen and oblige.

Geo. B. Ingraham
P.S.—Rasco Service is sure all it is cracked up to be. I have received three different orders from Rasco and I am still waiting for an order from another Company which was sent in before the first Rasco order.

Yours truly, 64 page catalog
G. B. I.

Our prices are low and all goods are shipped prepaid. You deal with the oldest and only Company exclusively manufacturing the small parts in their own two big factories. Our big 64-page catalog, No. 7, containing over 300 illustrations, will save you money. This catalog also contains

75 Diagrams of
Vacuum Tube Hook-Ups

not to be found in any catalog, only found in expensive text books. This catalog sent only upon receipt of 15¢. Once you have tried the RASCO service you are a customer for life. 85% of our customers always come back.



Detector
50c

Radio Specialty Co.

98-100 'ARK PLAGE, NEW YORK CITY

What is the Finest Receiving Set Made?

To be worthy of this distinction, the set must have three characteristics—

- World-wide receiving range—
- Reception in all wave lengths—
- Reception without distortion.

RadioCraft D-6 Regenerative Radiophone* (by permission of DeForest Radio Tel. & Tel. Co.) will receive even European stations, and of course all those on this continent.

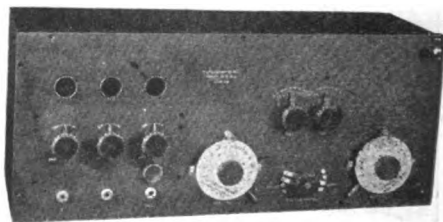
It receives on all amateur, broadcasting, and transatlantic wave lengths.

In clearness and avoidance of distortion, it must be heard to be adequately described.

D-6 uses outside aerial only, and head sets or loud speaker.

It claims to be the finest receiving set now manufactured and any authorized DeForest dealer (who also carries the RadioCraft line) will be glad to prove this to you by actual demonstration.

RadioCraft Regenerative Radiophones* (by permission of DeForest Radio Tel. & Tel. Co.)



**RadioCraft
Regenerative Receiver
Type D-6**

range from the simplest to the most elaborate.

It is unnecessary to add that this entire line of DeLuxe radio equipment is most exquisitely finished in every detail.

The Radiocraft Co.

139 Franklin Street, Jersey City, N. J.





De Forest
D-7
Reflex
Radiophone*

Listen to Half the Continent This Christmas!

HERE'S the latest DeForest triumph, the D-7 Reflex Radiophone* Receiver. It's the newest and most sensitive set of them all, with a thousand mile range on a two-foot indoor aerial!

That's what you've been waiting for.

No outside aerial is needed. The whole set is as you see it here.

Easy to control with its single knob—small, compact, super-efficient—and an ornament to any library table!

Economical to operate, too, because you get five stages of amplification on three tubes, and correspondingly longer life for your storage batteries.

If you want to bring into your home the news, the music, the lectures of half the American Continent—with no trouble—clearly without interfering noises—this is the set for you. Remember it's a Radio Christmas—and here's one set that is all you ever hoped a receiver could be. Ask your DeForest dealer about D7 and other DeForest sets—today.

De Forest Radio Tel. & Tel. Co.
JERSEY CITY, N. J.

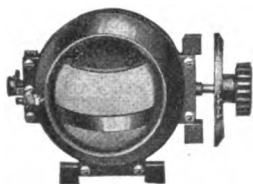


*Reg. U.S. Pat. Off.

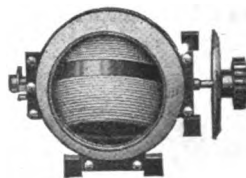


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DAYTON RADIO PRODUCTS



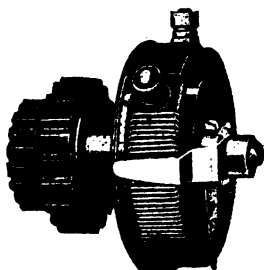
MOULDED BAKELITE VARIOMETER
 Price\$6.75
 With Bakelite Dial..... 7.35



MOULDED BAKELITE VARIO-COUPLER
 Price\$7.00
 With Bakelite Dial..... 7.60

We claim for these instruments the following distinctive features:

- 1—Use of genuine Bakelite throughout and elimination of all unnecessary metal parts.
- 2—Positive Contact to Rotor by use of pig-tails.
- 3—Convenience of mounting to either panel or table.
- 4—Stator has ledge for mounting an inductance coil to Variometer, making a complete Tuning Unit if desired.
- 5—High polish to Bakelite, beauty of design and unequalled efficiency.



The Dayton Bakelite Vernier Rheostat was designed to provide for extremely fine filament adjustments on the vacuum tube, it being especially efficient when using regenerative circuits for C.W. or Phone work, owing to the perfect adjustments obtained. Licensed under Patent #870,042.

PRICE\$1.75
 PRICE Plain Rheostat..... 1.10

The A-C Electrical Mfg. Co. Dayton, Ohio, U. S. A.
Makers of Electrical Devices for over 20 Years.

McTIGHE ALKALINE STORAGE "B" BATTERY

for RADIO OUTFITS



The McTighe Storage "B" Battery is the most satisfactory for radio use. It gives 22 volts, is inexpensive--noiseless--cannot be damaged by short circuit, overcharging, standing idle or uncharged. Can be fully charged from any light socket for less than one cent. Is furnished in an oblong glass case which nests neatly. The McTighe Rectifier is cheap, simple, durable, and effective, and should be used when charging the McTighe "B" Battery.

Battery \$5.00, Rectifier \$1.50, Rubber Filler 25¢
 F.O.B. Irwin, Pa.

Discount to Dealers Address Dept. O Prompt shipments

ECONOMIC APPLIANCE CO.
 IRWIN, PENNA.

A Nimble 'Dollar-Seller'

The "Chaslyn" Sink-or-Swim Ball Battery Testing Outfit

Set consists of

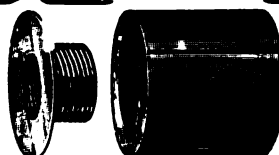
- 1 Battery Tester, with 8 balls of different colors and weights. The way they sink or swim shows condition of acid.
2. Depth Gauge for determining depth of acid.
3. Air-Controlled Bottle Stopper for adding distilled water.

Price of Set, \$1.00

Special Offer to Dealers.

Write on your business stationery enclose one dollar for TWO of the above sets.

THE CHASLYN COMPANY
 4317 Kenmore Ave. Chicago



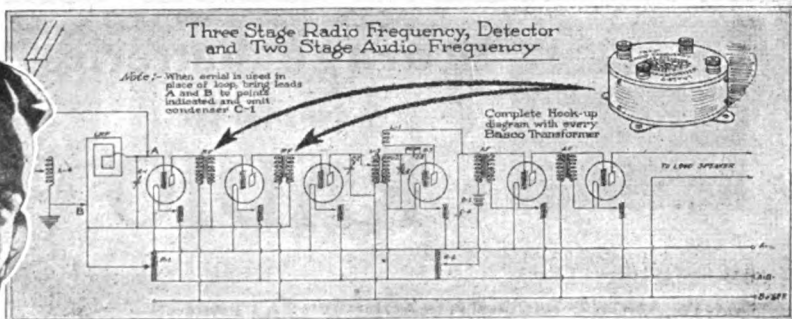
ATTENTION RADIOTICS
 IF YOU USE AMPLIFYING TUBES
 you can make your Victor talking machine a RADIO LOUD SPEAKER, with a "BEEKO" Radio-Phone attachment.

Sample by mail, 40¢.

Liberal discount in quantities

J. H. BUNNELL & CO.

32 Park Place, Department Q New York



Don't Let That Term--- "Radio Frequency," Scare You Out of Doubling Results

NO bugbear about it. Thousands of amateurs are accomplishing wonders with Radio Frequency. The greatest radio development of the day. A loop aerial and three stages of radio frequency hooked right to your regenerative outfit—"plate tuned" or "feed back"—doubles your signal strength, day or night—greatly increases your range and eliminates most of the static. Two stages are nearly as gratifying. Results will surprise you. Study the diagram shown above. And here's the ideal transformer for the job—the

**Basco Super-
Sensitive Receivers**



Light weight—aluminum case—extra sensitive. Clean cut, rugged design. See them. 2000 and 300 ohms.—\$6.00 and \$7.50 respectively.

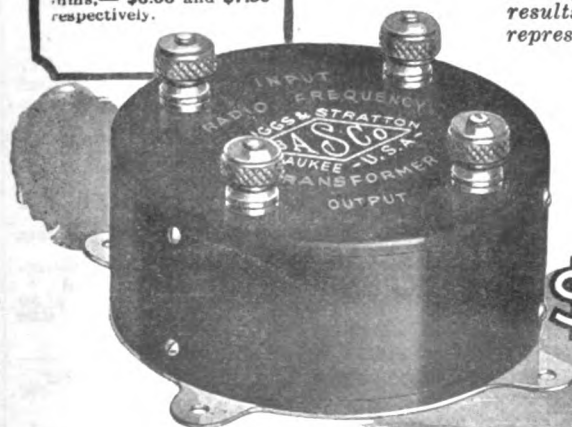


**Radio Frequency
Transformer**
"The Element of Certainty"

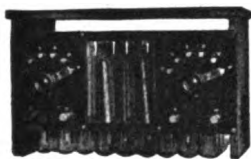
Thoroughly proved—for any well balanced circuit. Efficient. Operates over wave band of 200 to 600 meters. Affords great selectivity. Employs non-capacity winding—double silk covered wire—no enamel. Maximum transfer of energy. Clean cut—neat. High grade workmanship throughout. Encased in bakelite. Binding posts and base-mounting silver plated. No higher grade transformer can be built. Basco Radio Frequency Transformers are the first step toward a better outfit. If your dealer can't supply you, write us.

Jobbers and Dealers, write for particulars. No better, trade building transformer built. Gets results—gets business. We have local factory representatives. Write for name of nearest one.

 **Briggs & Stratton Co.**
Milwaukee, Wisconsin



\$5.00



Storage Batteries

designed for

RADIO



KICO "B" BATTERY

KICO "A" BATTERY

FACTS ABOUT KICO STORAGE "B" BATTERIES—

1. Alkaline type.
2. They eliminate noises caused from "Bs" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries sold with the privilege of receiving your money back if unsatisfied within a 90 day trial.
7. Neat, Efficient and Compact.
8. Unlimited life.

		Plain	With Panels
16 cell	22 volts	\$4.50	
24 cell	32 volts	8.00	\$12.00
36 cell	48 volts	10.00	14.00
50 cell	66 volts	12.00	17.00
78 cell	100 volts	16.00	21.00
108 cell	145 volts	21.00	26.00

Literature gladly furnished.

KIMLEY ELECTRIC CO., 1355 Fillmore Ave., BUFFALO, N. Y.

PANEL SERVICE

We offer to the amateur and dealer

REAL PANEL SERVICE.

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8" per square inch \$0.02

3/16" per square inch .02 1/2

1/4" per square inch .03

We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

PITTSBURGH RADIO

AND

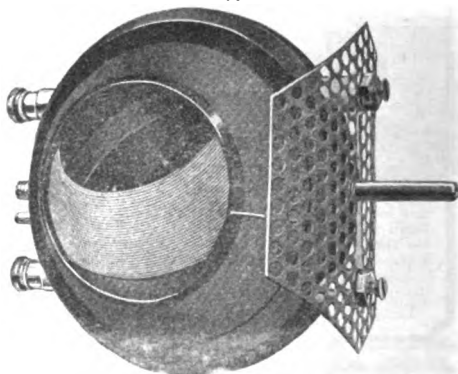
APPLIANCE CO., Inc.

"Pittsburgh's Radio Shop"

Desk B

112 Diamond St., Pittsburgh, Pa.

THE LAST WORD IN



Precision Variometers

Spaced bare lacquered wire prevents leakage and capacity effects.

Shells of newly discovered composition only .025" thick prevent dielectric hysteresis.

Perforated shield plate prevents eddy current losses.

Absolutely guaranteed. A superlative instrument.

Price ready for mounting—Variometer... \$7.50
Variocoupler... 8.00

Write for Sample Shell Coil

Dealers write for discounts.

HORTON CORP.,
Ridgefield Park, N. J.

DICTOGRAPH Radio HEAD SET

Was \$12.00 Now

**Why This Sensational
Reduction in Price?**

A sweeping cut of \$4.00 in the price of the Dictograph Radio Headset! The tremendous endorsement of radio enthusiasts has made possible this sensational reduction. To meet the demand, production has been planned on a new, gigantic scale. Great manufacturing economies establish the new price—only \$8.00.

A wonderful bargain! And above all, a wonderful headset—the world's standard of supreme quality for super-sensitive and accurate sound-transmission.

The same quality, the same guarantee, the same supreme Dictograph headset in every respect but the price. Type R-1, 3,000 ohms, for all types of receiving sets.

The Standard of the World



\$8

DICTOGRAPH Radio LOUD SPEAKER

**The Perfect Loud Speaker
for the Home**

Public demand has made possible the Dictograph Loud Speaker at the low price of only \$20.00, complete with 5 ft. flexible cord. A handsome instrument that reproduces every sound in crystal-clear, natural tones, full volume, and free from distortion or noise. Ask for demonstration at reliable radio dealers. Get world-famous DICTOGRAPH quality and still save money.

Dealers: Order through your jobber or write direct for names of authorized distributors.

Note: Plans are now under way for the production of the new 4,000 ohms Dictograph SUPER-TONE Headset, the most perfect radio headset that can be made. For the most delicate work, the most exacting requirements. A new standard of super-sensitivity! List Price, \$12.00.

List Price, \$20



DICTOGRAPH PRODUCTS CORPORATION

220 West 42d Street,

Branches in all principal cities

New York City

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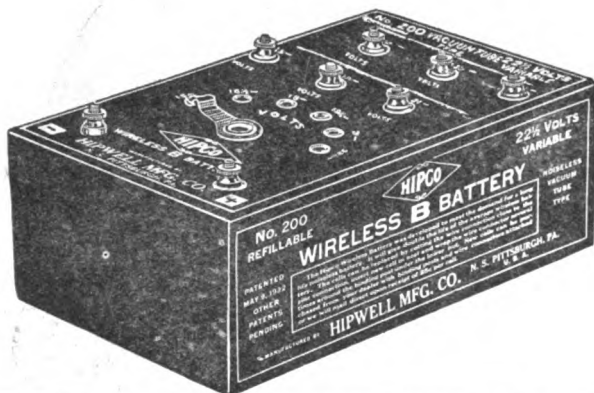
153



PRICE \$3.50

THE NEW IMPROVED WIRELESS B BATTERY REFILLABLE VARIABLE NOISELESS IN OPERATION

The Switch Makes It 100 p.c. Perfect



Must be seen to be appreciated. It has all the features that made last year's B Battery the phenomenal success. Ask for catalogue describing our full line of B Batteries and other Radio Supplies.

For sale at all radio supply dealers.

HIPWELL MFG. CO

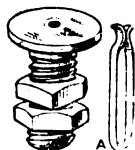
N. S. PITTSBURGH, PA.

JOBBERS and DEALERS Make **BIG Money**

Radio **RTS** Equipment

RTS Radio Equipment has become so popular that we have found it hard to meet the demand. But we have enlarged our plant, and now are prepared to supply standard and special equipment in any quantity.

R.T.S. CORD TIP JACKS



This new R.T.S. Cord Tip Jack leads the way in price particularly. Used in place of ordinary jack in Detector and last stage of amplification and in place of binding post and for experimenters in making any desired connection.

A—Illustrates inside of jack. Constructed of spring phosphor bronze highly nickel plated. By method of a wipping spring contact a clean and positive connection is always assured. Where others sell from \$1.00 to \$2.50 the R.T.S. Cord Tip Jacks are 50¢ per pair.

Amateurs order direct from dealers. If they can't supply R.T.S. will supply you direct.

Now is the time to "cash in" Big Profits! All RTS Specialties are in demand among amateurs in every part of the country! Write NOW for price list and special discounts to the trade.

RADIO TESTING STATION

Dept. Q-12. 25 Sturgis Street
Binghamton, New York



DONGAN

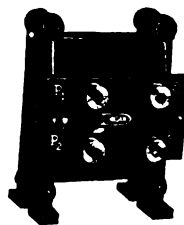
RADIO FREQUENCY TRANSFORMERS

are unexcelled for radio frequency amplification. The adjustable silicon core, (a patented feature) enables accurate tuning of the grid and plate circuit to the frequency of the incoming signals. Without an equal from 200 to 400 meter reception."

DONGAN

AMPLIFYING TRANSFORMERS

embody the DONGAN standard of high grade workmanship throughout. Scientifically constructed. Reasonable in price—Neat in appearance. Manufactured in ratios of 6-1 and 3 1/2-1.



Manufactured By

DONGAN ELECTRIC MFG. COMPANY

2983-2993 Franklin St.

DETROIT, MICH.

—Western Distributors—

SIERRA ELECTRIC COMPANY

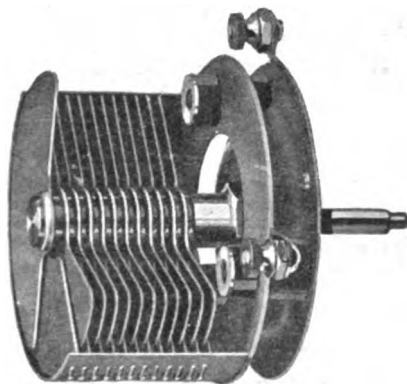
801-804 Roberts Bldg., Los Angeles, Calif.

515 Market St., San Francisco, Calif.

BUY THE BEST

The Thordarson Condenser

**Movable and
Stationary
Plates
Shielded**



**Single
Bearing

Simple
Vernier**

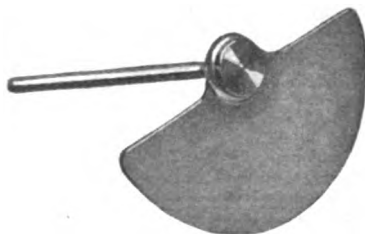
OUR LATEST PRODUCT

The best, most flexible and most complete variable condenser on the market today at any price:

Some of its features are:

- Movable and stationary plates completely shielded.
- Stationary plates spaced accurately by Special Punched Shell.
- Movable plates secured by an ingeniously assembled comb separator brushing against the bearing.
- Single bearing fastened directly to the shielding base plate without any dielectric.
- Assembled by machine.
- Lowest possible zero capacity and dielectric loss.

WITH OR WITHOUT THE VERNIER



A single plate

That can be added by anyone at any time at a very small cost.

			With Vernier, Knob and Dial
13 Plate	.00025 M.F.	Condenser \$2.00	\$3.50
23 Plate	.0005 M.F.	2.50	4.00
43 Plate	.001 M.F.	3.00	4.50

Vernier, only, furnished separate if desired, complete with knob \$0.60

THORDARSON ELECTRIC MFG. CO.

500 W. HURON STREET,

CHICAGO



KEEP TO THE RIGHT



Quality

Apparatus

We stock all makes and types of complete Radio sets and parts

Acme Apparatus Co.
Adams Morgan Co.
Andrea, F. A. D.
A. & P. Radio Supplies Co.
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Brach, L. S. Mfg. Co.
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Corwin, A. H. & Co.
Cutler-Hammer, Mfg. Co.
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Dubilier Condenser Co.
Eby Mfg. Co.
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Frost, Herbert H.
General Radio Co.
Kennedy, Colin B.
Murdock, Wm. J. Co.
Radio Distributing Co.
Radio Corp. of America
Remler Mfg. Co.
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Wireless Press Inc.

Delivery same day order received

Pioneers in the Radio Field

Send 10c for latest catalog

ROSE RADIO AND ELECTRICAL SUPPLIES

129 Camp St.

New Orleans, La.



He Hears the Bedtime Stories
with his Big Brother's

Stromberg-Carlson Radio Headset

This Standard Headset has unexcelled tonal qualities. Reproduces accurately faint long distance signals; fits comfortably and is quickly adjustable to any size head. The forked cord permits separation of the receivers for use by two observers simultaneously.

Other Stromberg-Carlson Specialties include the "Universal Radio Plug" and various styles of "Radio Jacks"—made to fit all standard equipment.

Order Stromberg-Carlson Apparatus
from your electrical merchandise
dealer or send for Bulletin #1029-Q.

Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.



UNIVOX 90° COUPLER FOR SINGLE—THREE CIRCUIT OR ARMSTRONG SUPER HOOKUP

A high grade unit priced right & unconditionally guaranteed. Formica tubes—Green silk wire. Nickel plated brass fittings. Good design—Perfect workmanship. Bulletin C describes in detail.

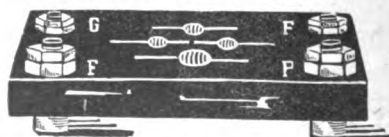


UNIVOX FILAMENT RHEOSTAT

Honestly made—Honestly priced. Bulletin F gives complete data. Splendid discount to the trade.

Walter R. Horning, Inc.
Mfrs. 'UNIVOX' Radio Units
Cleveland, O., U. S. A.

FRANKLIN SOCKET



For W-D-11—DRY CELL TUBE

Holds tube firmly.
Makes Perfect Contact

PRICE \$0.50

We also make an Adapter that fits Standard Sockets, Price \$1.00.—Dealers Write for Discounts.

FRANKLIN RADIO MFG. CO.
711 Penn Avenue, Wilkesburg, Pa.



MIGNON



RADIO APPARATUS

BEST BY TEST

STRAIGHT LINE

VARIABLE AIR CONDENSERS

TYPE "A"
.0005 M.F. \$4.50

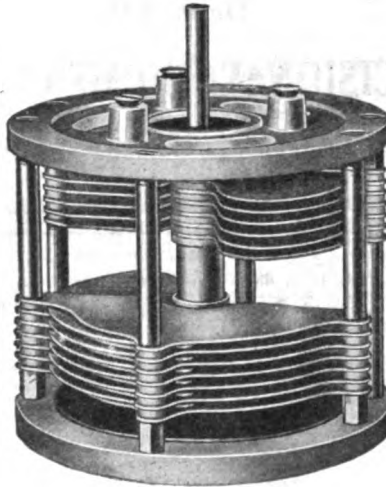
TYPE "A"
VERNIER
.0005 M.F. \$6.00

TYPE "B"
.0008 M.F. \$5.00

TYPE "B"
VERNIER
.0008 M.F. \$6.50

TYPE "C"
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TYPE "C"
VERNIER
.0017 M.F. \$7.50



SOLD
BY ALL
LEADING
ELECTRIC
FIRMS
AND
RADIO
DEALERS

TYPE "B" .0008 M.F.

Authorized Factory Representatives

Niagara Sales Corporation, 3-5 Waverly Place, New York, N. Y.

Western Radio Distributing Co., 1114 L. C. Smith Bldg., Seattle, Wash.

For New York Metropolitan Territory

Radio Stores Corporation, 218 W. 34th St., New York, N. Y.

Our Products are on exhibit at the PERMANENT RADIO FAIR

Hotel Imperial, New York, N. Y.

Write for Literature

MIGNON ELECTRIC MFG. CORP.

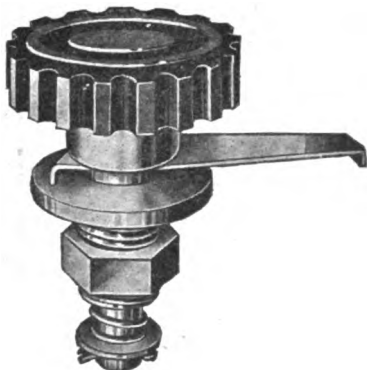
25-35 South Water Street,
ROCHESTER, N. Y.



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Use a REAL Switch Lever—



makeshift stuff never gives you proper results. Look at the good points in the ACE Panel Lever Switch; molded in shaft, therefore Knob cannot work loose—hexagonal shoulder absolutely guarantees blade against turning on shaft—perfect self-cleaning wipe contact at EACH end—spring and cotter pin tension—no nuts to loosen. Absolutely the finest switch lever obtainable. This and other high grade products of our factory listed in our new fall catalog; 10c brings it.

Dept. YB

THE PRECISION EQUIPMENT COMPANY

2437-39 GILBERT AVENUE,

CINCINNATI, OHIO

The Living Room Is No Place for a Storage Battery

Locate it in a permanent place away from fine furniture and rugs, then use a

LEICH NONTUNE RADIO RECTIFIER

to keep it in condition. No attention—just throw the switches. Safe—Convenient—Dependable.

Your tubes will work more consistently with the steady voltage delivered by a fully charged battery, and your evening entertainments will not be subjected to the annoyance of continual adjustment of tube filaments.

Your battery will have a longer life under these conditions.

THE Non Tune Radio Rectifier needs no attention while charging. During power interruptions storage battery circuit is automatically opened.

The Non Tune Rectifier is a time-tested instrument that is used extensively for railway signal and other work which requires an efficient and dependable machine.

Ask your dealer—or write for Bulletin 100.

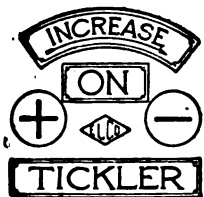
LEICH ELECTRIC CO. Manufacturers of

Telephones—Switchboards—Accessories.

GENOA, ILLINOIS



"ENGRAVE" YOUR PANEL



Letter your panels with ELCO RADIO PANEL TRANSFORMERS. Will adhere to any material. Very easily to apply. Enhance the appearance of a Radio Set 100%. Comes in card of 31 different wordings, everything necessary for the best kind of receiving set.

35c Price, per set, with directions, 35c (in coin)

Dealers write for samples and discounts

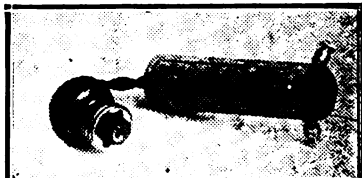
ELCO RADIO COMPANY

Dept. S.

410 Third Ave.,
158

Pittsburgh, Pa.

THE WIRELESS WONDER

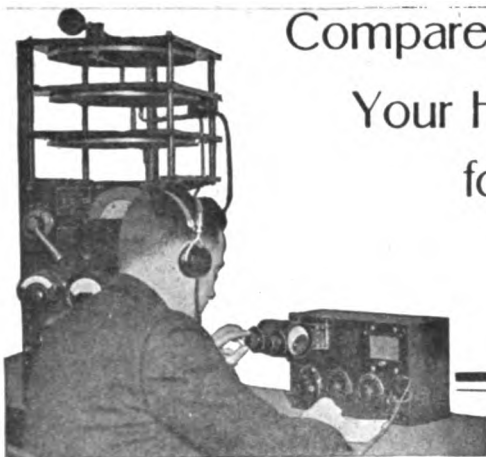


A Complete Aerial for \$1.50

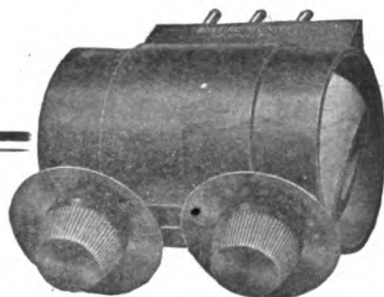
Simply screw in any lamp socket and turn key on. Better than an outdoor aerial. Nothing to get out of order. Eliminates lightning danger. Money back guarantee.

Radio Catalog free at your dealers or
STEINMETZ WIRELESS MFG. CO.
5706 Penn. Ave., Pittsburgh, Pa.
Electrical Engineers and Manufacturers

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS



Station 2AW, Brooklyn, N. Y.



DURING the A.R.R.L. tests of October 27th and October 28th, 1922, the following C.W. and Spark Stations were copied at 2AW, Brooklyn, New York, through heavy static, using a Tunit with detector and two step amplifier:

3HL, 3BGT, 4GL, 4EB, 5EK, 8BDA, 8QO, 8AQO, 8AIW, 8BVR, 8BUM, 8AXC, 8DE, 8BZY, 8ADN, 8ZE, 8UK, 8AXB, 8BXH, 8AWP, 8ANJ, 8ACQ, 8XH, 8ZX, 8BNJ, 8XE, 8ON, 8QK, 8BPL, 8OW, 8BXH, 8IB, 8YM, 8CNW, 9CP, 9AWF, 9KE, 9CN, 9AAU, 9AUL, 9DYN, 9II, 9AJF, 9IO, 9XAC, 9AA, 9ZN, 9UU, Canadian, 3CO, 3FO, 9AW.

This reception has been confirmed by mail and was not surpassed by stations using high-grade regenerative receivers of standard manufacture.

There is no comparison between the Honeycomb coils and the Tunit on short wave lengths. All A.R.R.L. stations should use a Tunit in their Honeycomb coil sets. For C.W. work on 160-600 meters it cannot be excelled. Its shielded dials, perfectly balanced, make the closest kind of tuning possible, without the objectionable capacity effects, common to Honeycomb coils.

Your dealer should have Tunits in stock. If he cannot supply you, order from us direct, enclosing money order for \$15.

**SHIP OWNERS
RADIO SERVICE
INC.**

80 Washington Street, New York

Wholesale Distributors

BRANCHES:

Boston, 46 Cornhill
Baltimore, 11 N. Eutaw St.
New Orleans, 740 Union St.
San Francisco, 591 Mission St.
Chicago, 538 So. Dearborn St.
Seattle, 67 Columbia St.





HAVE YOU HEARD THE NEW RADIOLA GRAND?

No storage battery necessary;
a complete and portable unit.
Have your dealer order from
us. We are also distributors
of the famous Grebe products.

TRADE-MARK



REGISTERED

PHILADELPHIA WIRELESS SALES CORPORATION

Formerly Philadelphia Wireless School of Telegraphy

1533 PINE STREET,
Wholesale Dept.

PHILADELPHIA

1326 ARCH ST.
Retail Dept.

Getting Astounding Results

Amateurs in every state and many abroad as well have worked or heard 22L. His station is known from coast to coast. Many wonder how he does it. He has told the tale partly over the air, and partly to those who have been fortunate enough to visit him at Valley Stream, Long Island. Now for the first time the whole story has been put into print for anybody to read. J. O. Smith (22L) has written the book of the year:

MODERN RADIO OPERATION

By J. O. Smith

No theory, no mathematics, no formulas, just a straight account of how it is done by C.W., not only at 22L, but also at other famous stations such as 1ZE, 8ZG and 9ZG which were installed by Mr. Smith. Also, the story of broadcasting from WBY, WGY and WJZ.

Receiving too—by all types of sets, including the Armstrong super-regenerative circuit.

DO YOU KNOW?—The proper proportion of grid and plate current in transmitters? The relative merits of D.C. on transmitter tube plates; of A.C. with half-wave rectification; of A.C. with full wave rectification; of Kenotron-rectified A.C.? How much you can gain by adding more tubes to your transmitter? How and why C.W. beats spark in purity, damping and economy? All these and many other vital questions are answered.

"Modern Radio Operation,"\$1.75

By J. O. Smith

"The Wireless Age" for one year... 2.50

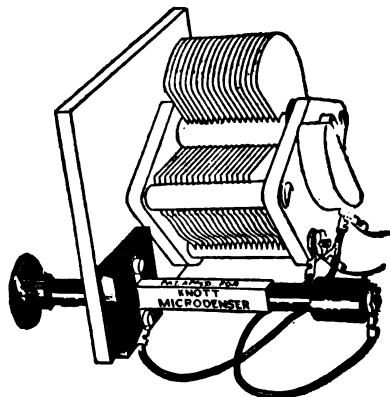
SPECIAL OFFER \$4.25

BOTH for \$3.75 (foreign postage, 50¢ extra)

WIRELESS PRESS, INC.

328 Broadway New York City

Knott Super-vernier Condenser



(Trade Mark Registered)

Showing how you connect to Condenser
Tune in that message or music you have been
losing. Tune out that interference. Bring it in
and clear it up.

Tune your condenser to the whistle and then
bring in the messages with this Micro.

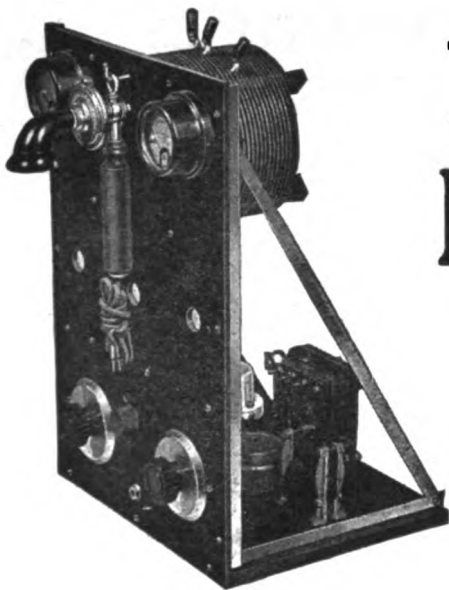
Buy it of your dealer, or send us \$2.75 and
we will mail you one complete with connecting
wires and wrench-screw driver.

Knott Sure Ground, Radio Name Plates, Patent
Dial, Rheostat, Quodcoil, Cincocoil, Microstat.

Send Postal Card for Circulars.
Jobbers write for our proposition. It will please
you.

E. R. KNOTT MACHINE CO.

Boston 27, Mass.



1500 MILES

With CW!!

1100 Miles Voice!

***Music Heard 40 Feet From
Phones by Stations in 300
to 400 Miles Radius***

THESE are actual results obtained by our testing station WEB, using the Benwood CW Transmitter shown herewith. You can get just as good results with it. This high-class set is just the thing for your broadcasting and DX work—using CW, ICW, Modulated Buzzer or Voice Transmission. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union. It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design. We guarantee it to radiate $1\frac{1}{2}$ Amps. on the average amateur antenna and 2 to 3 Amps. when used with an antenna whose fundamental wavelength is 225 to 275 meters. That's why you can get such wonderful results.

Read This Testimonial

Broadcasting station WSN, the Ship Owners Radio Service, Inc., located at Norfolk, Va. wrote us on August 10th (fine season for static) as follows:—

Gentlemen:

I thought possibly you would be interested to know of the remarkable results we have obtained from the 15 watt Benwood Phone set we purchased from you.

We are only using two 5-watt tubes in your set and on several occasions have been reported in Long Island, N. Y.—Phila., Pa.—Cape May, N. J. and Newman, Ga. which is approximately 700 miles from here. Our record was established last week by being reported by O. R. Krannich, 215

South Street, Iola, Kansas, a distance of approximately 1000 miles.

The remarkable part of this occurrence is that this distance was covered under the most undesirable conditions as we are unable to erect a suitable antenna or obtain a good ground. Our place of business is a one story building situated between two ten story buildings and there is certainly a great deal of current absorbed.

Yours very truly,

O. S. Meek

The Benwood CW Transmitter is completely wired and set up. You can start sending as soon as you insert tubes and attach to ground and antenna. Complete, without tubes, \$350.00—if your dealer cannot supply you, write to us direct, giving us his name.

Ask Your Dealer For Benwood Radio Apparatus

The **BENWOOD** Co. INC.
RADIO
"WORLD-WIDE MAIL ORDER SERVICE"
1114 OLIVE STREET ST. LOUIS, MO.

KQV-Pittsburgh, Pa.—RADIO BROADCASTING STATIONS—Washington, D.C.—WMU

STANDARD RADIO ESSENTIALS

All orders with remittance promptly delivered, Post or Express paid.

Large and varied stock of modern and reliable

RADIO EQUIPMENT and PARTS

ALWAYS in STOCK

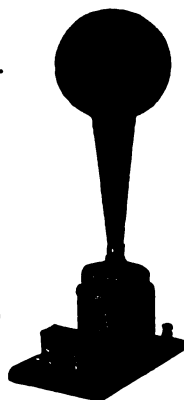
IMMEDIATE DELIVERY on ALL ITEMS LISTED



Stromberg-Carlson

No. 2-A Headset, \$7.50 Enclose Certified Check or P.O. Money Order with orders.

Aerola Senior Westinghouse Receiver.....	\$65.00
DeForest Radiohome Set DT 700, less Batteries,	
Bulbs and Headset	36.00
DeForest 2-stage Amplifier DT 800, less Bulbs and	
Batteries	35.00
Simplex Variometers	6.00
King Amplitone Horns	12.00
Holtzer-Cnbot Headset	8.00
UV 200 Radiotron Detector Bulbs	5.00
UV 201 Radiotron Detector Bulbs.....each	6.50
Standard Horns 7" Bell	7.50
Standard Horns 5" Bell	5.00
RK Horns	5.00



DOUBLEDAY-HILL ELECTRIC CO.

WASHINGTON, D. C.—DEALERS WRITE FOR DISCOUNT—PITTSBURGH, PA.

AUTOMATIC FILAMENT CURRENT ADJUSTER



\$1.10 WITH MOUNTING

Eliminates Rheostats in all amplifying circuits.
Operates vacuum tubes at greatest efficiency without adjustments of any kind.
Automatically keeps filament at proper temperature thereby prolonging life of tubes from two to three times, and preventing "burning out."
Eliminates need of measuring instruments.
Easily attached, simplifies wiring, permits compactness, improves appearance of panels and sets.
Must be used in every vacuum tube circuit in order to insure continuous operation at maximum efficiency.
Used as standard equipment by leading manufacturers.

AMPERITE

Manufactured by

RADIALL COMPANY

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**Compact — Interchangeable
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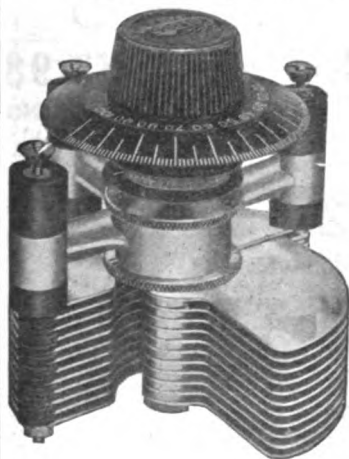
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Cotoco

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Radio Supplies Made For Better Results

DESIGNED by an organization of Electrical and Mechanical Experts. Made to supply the needs of those amateurs and professionals in radio who know and demand the best. You will find Cotoco Products displayed by those wiser dealers who are building permanent business on radio supplies that give maximum results and by keeping abreast of the latest developments in radio,—namely radio frequency and loop aerials.



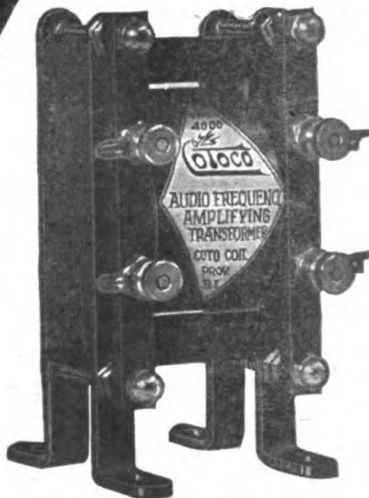
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COTOCO VARIABLE AIR CONDENSERS

are scientifically correct to minimize electrical losses. We have tested many condensers but have never found their equal.

Works just as smoothly as a fine watch, because it's made as well.

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Banished*



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Loop Aerials Available to All

Beyond our most sanguine expectations we have succeeded in overcoming Static and securing great range with Loop Aerials. Distortion in headphones or loud speaker is practically unknown with a Cotoco built set, using Cotoco Amplifying Transformer for Audio Frequency (above) and Cotoco Amplifying Transformers of tapped type for Radio Frequency (below). Most selective. Almost Static-proof. Write for connection diagram.

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Write us his name and address. We will see that you are supplied with

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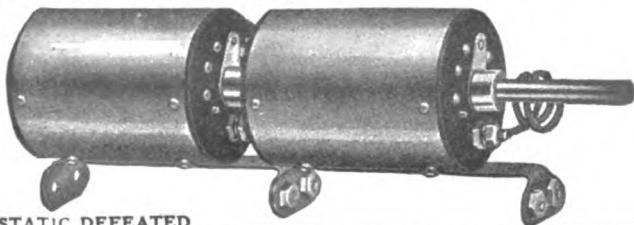
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using either two or three
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APPROVED by Underwriters' Laboratories, latest Code. Carbon block type (not vacuum type) using a brown glazed porcelain case which can be installed inside or outdoors. Carbon block arresters have been standard in Railway signal and telephone protection for over 20 years. Ask your dealer or write us for special circular.

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Eliminates all detector troubles. 50% increase in clearness and volume. Endorsed by Radio experts and press. Awarded certificates of excellence. Sets a new standard of efficiency.

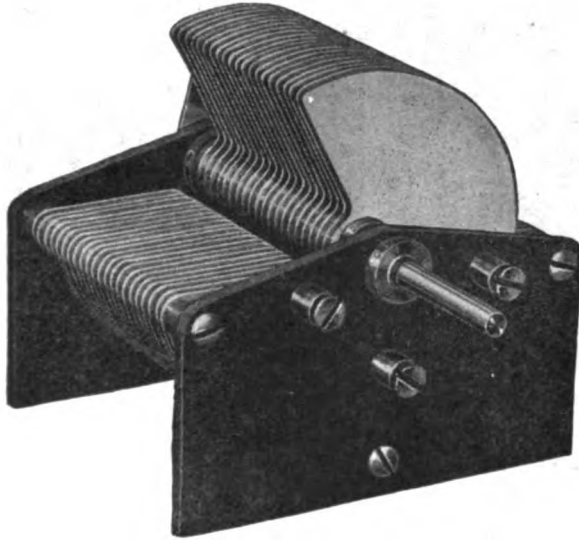
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Sensitiveness guaranteed

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Wimco Announces



THE WIMCO VARIABLE CONDENSER

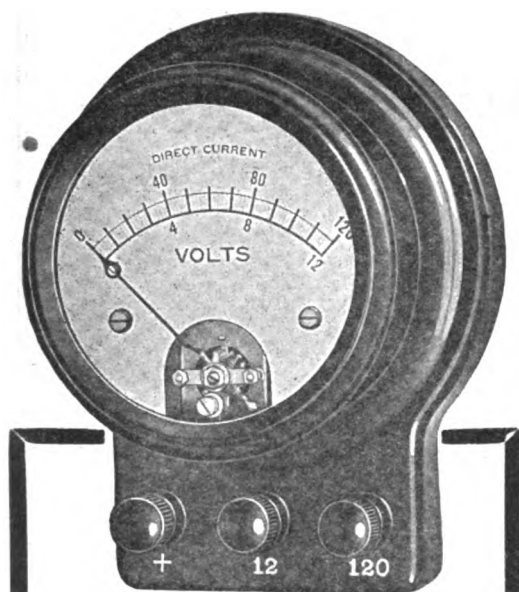
After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

The WIMCO Variable Condenser is now in production and your orders will have our best attention.

We have a very attractive proposition for the Jobber, and solicit inquiries. Write for complete price list and discount sheet.

THE WIRELESS MANUFACTURING CO.
CANTON, OHIO

Manufacturers — Distributors



A-B BATTERY TESTER

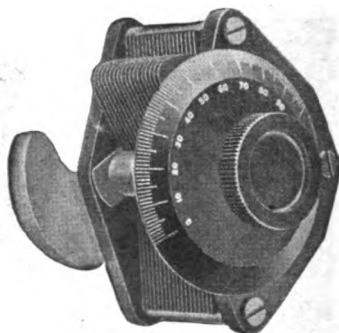
The Jewell A-B Battery tester fills a need for a low priced but accurate portable instrument for checking battery voltages. Double readings 0-12-120 volts is the range usually supplied, which takes care of the "A" battery under all conditions and the "B" battery up to the highest commonly used for receiving.

PRICE \$10.00

We were the first to supply a complete line of miniature radio instruments of uniform size. Ask your dealer or write to us for complete radio circular.

Jewell Electrical Instrument Co.
1650 Walnut Street, Chicago

CHELSEA CONDENSERS



No. 3

PRICES

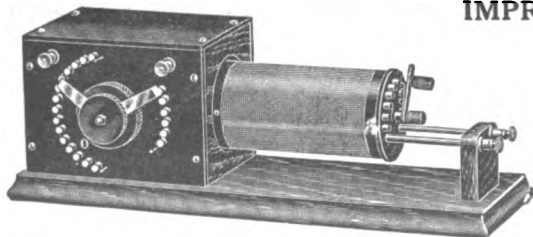
No. 1	Table .001 mf.	\$5.00
No. 2	Table .0005 mf.	4.50
No. 3	Panel .001 mf. with dial	4.75
No. 3a	Panel .001 mf. without dial	4.35
No. 4	Panel .0005 mf. with dial	4.25
No. 4a	Panel .0005 mf. without dial	3.85
No. 5	Panel .00025 mf. with dial	3.75
No. 5a	Panel .00025 mf. without dial	3.35
No. 6	Panel vernier with dial	2.90
No. 6a	Panel vernier without dial	2.50
No. 7	Table .001 mf. with vernier	6.75
No. 8	Panel .001 mf. with vernier	6.50

Genuine Bakelite Construction
The best and most complete line of condensers in existence.
Write for our catalog No. 7.

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156 FIFTH STREET
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ARNOLD LOOSE COUPLER

IMPROVED MODEL, PRICE \$18.00



The most consistent piece of apparatus to hear the Radio Telephone (without distortion). Range of wave length from 200 to 2,500 meters.

Send 3¢ stamp for literature which describes fully the Loose Coupler, Hook-ups, etc., also the New Arnold Loud Speaker. Full line of Detectors, Amplifiers, and better class of accessories.

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MU-RAD

Radio Frequency Amplification

MU-RAD Receiving Sets are the original product of independent experiments and experience of leading radio engineers. Five years intensive development of Radio Frequency Amplification have given Mu-Rad Sets exclusive points of difference—points that are well worth your consideration. First, unequalled **sensitivity**. Distances in excess of 1000 miles have been covered by Mu-Rad Sets using a 3 in. diameter, inside loop aerial. Second, the **selectivity** of Mu-Rad Sets which permits differentiation of stations 1% off tune and third, the **simplicity of operation**. All tuning can be done with one hand. The high selectivity is retained by the use of patent circuits and Mu-Rad R. F. Amplifier Transformers.



THE MA-12

Three stages of radio frequency amplification and detector. With 2 telephone plugs **\$128.00**

THE MA-13

Three stages of radio frequency amplification, detector and two stages of audio frequency amplification. With two telephone plugs **\$160.00**

1000 MILE RANGE GUARANTEED

Each MU-RAD set is sold with an attached guarantee of 1000 mile reception under average conditions using a small loop aerial.

SPECIFICATIONS

Cabinet: Solid mahogany, varnished piano finish.
Panel: Mirror polished black Radion.
Dials: Non-warping metal—prevent body capacity effects.
Condensers: 21 plate, permanent capacity.
Modifier: A circuit unit, dial operated from panel, for controlling signal strength and stabilizing circuits.
Rheostats: Special sector wound, smooth operation, positive contact.
Filament Switch: Special positive toggle knife-blade construction.
Binding Posts: Polished nickel, all in rear, plainly marked.
Name Plates: Extra deep reversed etched, black with satin silver high-lights.
Wiring: Tinned copper bus-wire, all interior metal white nickel finish.

*The New
Star in
the Radio
World*



MU-RAD R-F Amplifying Transformers

200-600 Meters—Air Core

The same transformer that gives to MU-RAD Receivers their extreme R-F Amplification. The skill of MU-RAD Radio engineers has been concentrated on this instrument until all the objections common to most transformers were entirely eliminated.

The absence of the usual iron core increases amplification by eliminating iron losses. No metal to produce undesirable capacity effects and eddy current loss

Three Types

Type T-11 for the first stage \$6.00
Type T-11A for the second stage \$6.50
Type T-11B for the third stage \$7.00

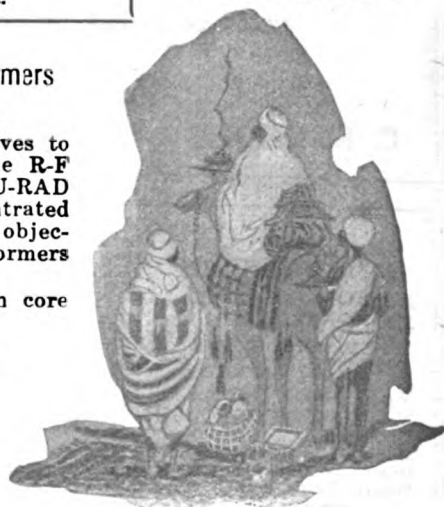
Mu-Rad apparatus sold everywhere.

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LET'S MAKE THIS A REAL RADIO CHRISTMAS

The Holiday season is going to mean increased Radio Sales. **THE EBY SILENT SALESMAN** (illustrated below) will assist you in making quicker sales, as the prospective customer can wait on himself.



Price to Jobbers,
Dealers and Manufacturers—\$1 Ea.

Full information as to specifications and prices of posts printed on the back. Cut shows our complete line, and our large stock means immediate deliveries.

Invest in two of these attractive boards. They will pay for themselves the first week.
THE H. H. EBY MANUFACTURING COMPANY, Philadelphia, Penna.

Trade Mark **BKUMA YRLSBUG**

Reg. Ap. For

Attentive Beginners Who Use

Dodge One Dollar Radio Short Cut

Have Mastered Code in Minutes instead of Weeks.

Have Qualified for Exam in Hours instead of Months.

Have Succeeded After Failing with Other Methods.

Send one dime for Code Memorizing Records made by Our Beginners in Twelve Radio Districts, who now are Licensed Operators. Know what others have done. Realize what you may do.

FOR EACH DIME OF COST OUR METHOD SAVES DOLLARS

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PRICE WILL ADVANCE JANUARY 1st

C. K. DODGE

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MAMARONECK, N. Y.

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MURDOCK PHONES No. 56

2000 OHM\$3.98

3000 OHM\$4.98

Variometers & Variocouplers

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VARIOCOUPLER LESS DIAL...\$3.98

Add 60¢ for 3" Dial

Mailing Charges on Each Item 10¢. Send Your Order At Once As There Is Only a Limited Supply Left.

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RADIO CO.**

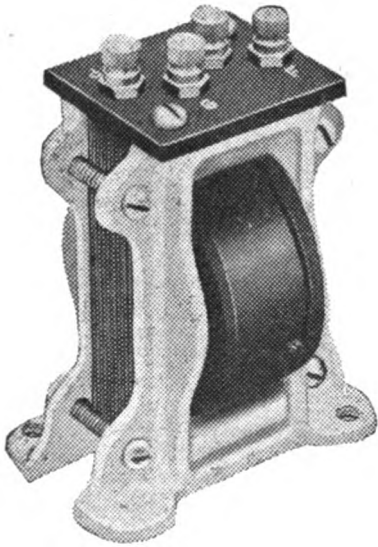
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EVERETT PHONES
*Not the Loudest
But the clearest.* **\$8.50**
At your dealers, or write

EVERETT ELECTRIC CORP.
320 Broadway, New York



PRICE \$6.00

The 3YQ safely meets the exceptional demands of the new Armstrong Super - Regenerative Circuit.

Make It a Radio Christmas with 3YQ Transformers

Nothing is closer to the heart of your friends than Radio. Guide yourself with this thought in selecting gifts for them.

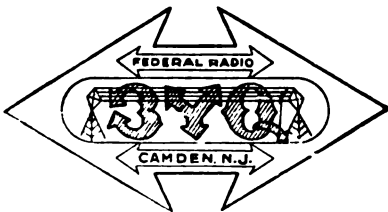
And, of course, you want to give them the best. If you are giving a complete set, select the type using 3YQ Transformers for audio frequency amplification.

If you are having a set specially assembled, specify 3YQ for maximum amplification without distortion.

And, if you or your friends are constructing laboratory or parlor receivers, you'll want the 3YQ.

The Christmas Spirit is a spirit of friendliness that says only the best is good enough. That's the spirit we put behind the manufacture of 3YQ Transformers all year 'round.

Remember the name—3YQ. Get them from your dealer.



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Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 10th of month for succeeding month's issue.

FOR SALE: Grebe CR-9 regenerative receiver, detector, and two stage. Bought new June last; perfect condition. List \$130. First money order \$100 takes it. Sidney Adams, Rock Hill, S. C.

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FOR SALE J-Ray Cap. \$20; 1 1/4 K.W. transformer, \$20, with condenser \$30; 1 1/4 KW Transformer, \$18; 1 1/4 K.W. O.T. \$8.00; National Portable Typewriter \$35; Amrad 1 K.W. Cap. \$18; Det. & 2 step \$30, Cash only. Lawton Biddle, 442 Busart Ave., Indianapolis, Ind. 9KM.

BARGAINS: Paragon RA6 \$26.95; 43 Plate Variables \$2.95; Manhattan Phones \$1.95; VT Sockets \$0.95; Burned Audiotron \$1.50; 4 Pole DT non-capacity Switch \$2.45; 1 KW Thordarson Type R \$24.50; Grebe 12 Stud Rotary with Induction Motor \$19.75; Boston Key \$4.25; Oil Condenser \$9.75; Wide Ribbon Oscillation Transformer \$4.95; 10 Amp. Ammeter \$3.95; Aerial Switch \$1.95; Magnavox Instruments 10% off. Robt. Bishop, Locust St., Luckport, N. Y.

STANDARD REGENERATIVE radiophone receiver including detector, Bradleystat, \$39.00. Sydney Budington, Elmhurst, Pa.

GENUINE LITZEN-DRAHT WIRE, 3x16x38 (48-Strands), enameled with two wraps of natural silk. One and a half cents per foot or \$5.55 per pound (approximately 400 feet). Shipped prepaid to any point in the United States. R. D. Borden, 650-Munsey Building, Washington, D. C.

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FOR SALE: Clapp-Eastham Special Panel-type "High Tone" Spark Transmitter—Range 1/4 to 2 Kilowatt. Complete with Sollenoid Aerial Switch—Excellent condition and very reasonable—write for information and picture. Chas. Brain, Allan Apartments, Springfield, Ohio.

NEW TYPE Western Electric VT 2's at \$6.40, 5 watt or amplifier. R. Breunig, 2252 Roscoe St., Chicago, Ill.

RADIO FREQUENCY AMPLIFIER, two step, mounted on Formica Panel—it works—\$20. Tubular Audiotron with cabinet, \$10. Write for list of other instruments. Brown, 123 1/4 Page, Dallas, Texas

TWO ATWATER-KENT Variometers, one Variocoupler @ \$7.00 Ea. Two Croft Variometers @ \$4.50 Ea. One Croft Variocoupler (180°) @ \$4.95. One Horne combination detector and two-step Amplifier @ \$49.00 Ea. One Horne Detector Unit @ \$12.50 Ea. One Kennedy type 281 Receiver @ \$70.00. One Kennedy type 521 Amplifier @ \$45.00 Ea. and many other bargains, all guaranteed perfect. If you have anything to sell or trade, write us. Buynrite Co., P. O. Box 82, (Benson Station), Omaha, Nebr.

COMPLETE Variometer Parts with Hardware \$1.10. Guaranteed Perfect. Norvell Canfield, Luverne, Minn.

RUBBER STAMP with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred Post Cards 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

5 KW ROTARY CONVERTER. Make offer. Robert M. Chase, Plymouth, New Hampshire.

FREE: With each Moorhead detector tube \$5.00, we will give one Fada receiving rheostat. With each R-3 Magnavox, \$45.00, we will give two No. 2156BP large Burgess "B" batteries. Chesaning Electric Co., Chesaning, Mich.

WESTERN ELECTRIC PHONES, \$8.80. German Detector Amplifier tubes; flat plate, \$4.65. German H.W. ammeters list \$8.50, special \$3.95. Jewell D. C. ammeters, \$4.25. Magnavox, \$36.00. Add postage. Send stamps for descriptive matter. E. Coffin, 8819 88th Street, Woodhaven, N. Y.

A REAL BARGAIN a 5 watt C.W. and fone set including 1 Western Elec. V.T. 2, radiation, fil., plate current, plate voltage; meters: 200 watt motor generator, fil. trans., RC inductance, Federal microphone, var. cond., filter cond., choke; mounted on panel with aluminum bracing, wired reverse feedback. Shipped C.O.D., \$125.00. Bruce Cranz, 46 N. Balch St., Akron, Ohio.

9BUD's 20 WATT CW & fone heard on both coasts in one week on detector, 1XM, 2BUM, 6AJH, 7ABB, 3GG Can. Radiating 3TC Amps. on 185 M a bargain at \$250.00 for everything as advertised last month. Box 967, Ogden, Iowa.

FOR SALE: Complete radio receiver 800 meter maximum, detector, two steps, Storage battery, B batteries, phones, tubes, and Magnavox. Perfect condition. Bargain at \$150.00. All inquiries answered. C. S. Cushman, 817 Wellington St., Flint, Mich.

WANT: 500 cycle set. Cash or trade RC West Receiver. 2UA.

NEW 15 dial omnigraph—\$20 takes it. M. Del Monte, 851 Vernon Pl. Pl., Chicago, Ill.

FOR SALE: Doran short wave regenerative & two step, \$100, cost \$130; King Am-Pli-Tone, \$90; Two General Electric R.F. amplifying transformers, \$5 each. Above slightly used, guaranteed as good as new. Sent Postpaid. Jack Dunham, 49 Overlook Circle, New Rochelle, N. Y.

500 CYCLES FOR THE PLATE—1/4 KW Motor Generator \$42.50; 1/4 KW Motor Generator \$45.00; 1/4 KW Navy Panel QUENCHED TRANSMITTER Complete Including Motor Generator, fine for school instruction, cost \$150, Sell For \$85. 1/4 KW Marconi Synchronous Transmitter Complete Including Motor Generator \$55.00. Above is all 500 cycle Apparatus. Navy Instruction Set, consists of Seven Stations \$35. Army 53 ft. Sectional Pole \$25. Navy receiving Sets \$22.50 Quenched Caps \$4.00. Leyden Jars \$2.25. All Guaranteed Perfect Condition Prompt Shipment. George Eaton, 1915 South Twelfth, Philadelphia, Pa.

TUBES: Radiotron amplifiers \$5.00; Cunningham amplifiers \$5.00; Western Electric VT-1 \$7.00; VT-2 \$8.00; Westinghouse dry cell tubes WD-11 \$8.00. Kenotron \$6.00. All the tubes have been used very little. Have two or three of each kind to dispose of. A. M. Elliott, 621 No. Fifth Ave., Phoenix, Arizona.

FOR SALE: Ten (10) Dynamotors: Motor Side 8 volts; Generator Side, 600 volts; Manufactured for the United States Aviation Service. Price \$35.00 Eksaf Trading Company, 1515 Eastern Parkway, Brooklyn, N. Y.

FOR THIRTY DAYS: Radiotron tubes, detector—\$5.00, Premium Composition Socket. Amplifier—\$6.50, premium Socket. Erado Variometer \$5.00, premium Sterling Rheostat. Erado Variocoupler—\$4.50, premium Sterling Rheostat. Many others. Write for our list of premiums. Enid Radio Distributing Co., Enid, Oklahoma. Radio WNAF.

VACUUM TUBE SOCKETS 50c each. Money back guarantee. I. Fonger, 145 Pine St., Muskegon, Mich.

SELL set of Duo-lateral coils, new. Carl Frank, Rochester, Minn.

MUST SELL: Thordarson 1KV 25,000 V Transformer \$72.50; 1/4" plate-glass oil condenser .008 mfd. holds 50,000 V on "sink" \$30.00; Benwood Rotor \$4.00; heavy Boston Key \$4.00; standard slide projection machine, made by DARLOT, Paris, fine for clubs, etc., complete with 1000 watt concentrated filament lamp, cord, bargain for \$80.00. Guaranteed. Sent Express C.O.D. for 1-3 amount to show good will. W. E. Gemmill, 434 N. Beaver St., York, Pa.

BURNT OUT Tubes Repaired. All makes of detector \$3.00. All amplifiers & 5 watt tubes \$3.50. Satisfaction guaranteed. Gillmore, 46 Thomas St., Newark, N. J.

DETECTOR PANELS, Bradleystat or Klossner controls, \$6. Lloyd Gress, Absecon, New Jersey.

BARGAIN: Combination tuner, Variometer set, Detector 1 step, tuner R.F. Vernier rheostats, Honeycomb Coil set, 3 vernier condensers. All new equipment, \$40. New. Absolutely unused "Kico" 148 volt storage B, cost \$21, take \$14; terms C.O.D. H. Oge, Bensville, Ind. Box 32.

WESTINGHOUSE R C \$100, Senior 52, Junior 18. All new guaranteed. Retiring from business. H. E. Peck, 62 Governor St., Providence, R. I.

WANTED: C.W. Sell: 1/2 KW Thordarson, \$8.00. Murdock O. T., \$2.00. Winthrop Packard, Canton, Mass.

TRANSMITTING GRIDLEAKS 5000 Ohm Radio Corporation, Five Watt size \$1.10; Fifty Watt size \$1.65; post paid. Philadelphia Wireless Sales Corp., 1533 Pine St., Philadelphia, Pa.

BARGAIN: Slightly used detector and 2 step amplifier with bakelite panel, cabinet and jacks \$35.00. M. S. Powell, Glen Ridge, N. J.

STORAGE BATTERIES: Gov't Signal Corps Edison 3 cell, type BB-4 \$4.50 and Willard 4 cell, type SYR-13 \$4.25. Willard light weight 40 A. H. for Aeriola tubes \$5.50. Edison 6 V. \$5.00. Edison Elements 10c pair. All new, remarkable bargains, act quick, cash with order. Several bargains. Complete receiving outfits. Two stage amplifiers. Three tube Armstrong Super set. Almost new 4 tube C.W. & Phone Transmitter. Quality Radio Shop, Richmond, Indiana.

TEN PER CENT discount on all standard radio goods. Superior two step Amplifier \$25.00. Radiotron Detectors \$4.25. Amplifiers \$5.75. Trans-Atlantic Phones \$8.00, 6 volt 210 Amp. hour Batteries, \$29.75. Homchargers \$15.75. QST Radio Service, Williamsport, Pa.

TWO STEP AMPLIFIER panel \$26.00. Two step amplifier in cabinet \$29.00. Both the above are equipped with General Radio transformers. Chesaning Electric Co., Chesaning, Mich.

SELL: Reinartz tuner with detector, \$23; two step, \$28; detector and two step \$32; 3 tubes \$12; etc. N. Raakhodoff, 112 Everett St., Springfield, Mass.

GENUINE GERMAN TELEFUNKEN VALVES. 20 Watt (output) transmitters with bases, \$14.75; Detector-Amplifier valves, flat plate grid type, \$3.95 each; 2K.W. 240 cycle 500 volt 4 amp. output Diehl motor-generator with D.C. drive \$45.00; 0-5 Jewell filament ammeters, \$3.65. Robert E. Goll, 1342 East 22nd St., Brooklyn, N. Y.

RADIO REPAIRING—anything but tubes. Send us your apparatus that won't work. We'll make it "percolate" or charge you nothing. Prices quoted for your approval before we begin work. Only bona fide advertised radio repair shop in the U. S. Repair Dept., Radio Panel Shop, Junction City, Kansas.

FOR SALE: Omnigraph 2 Jr. with 25 dials \$12.50; Double coil mounting with 25 and 35 coils \$4.00; Spark gap \$1.00. Louis Ratisseau, 3812 Ave. P. Galveston, Texas.

HONEYCOMB Coil Regenerative, including Coils and Radiotron Detector \$50.00. Box 205, Williamsport, Pa.

CALIBRATED CHOKE Coils for "Reinartz Receiver" 200—250—300 meters. No stamps. Cost of choke 50c. J. F. R., Radio IQP, South Manchester, Conn.

RADIO FREQUENCY TRANSFORMERS 150-600 meters \$3.75. Bakelite vario couplers \$4.00. Moulded variometers \$5.00. Cunningham detector tubes \$4.70. Amplifiers \$5.20. Western Electric VT1s \$7.50, VT 2 \$8.00, R-3 Magnavox \$39.50. Reduction on all Radio supplies. Saginaw Radio Service, Saginaw, Mich.

BARGAIN: Storage Battery, Tunit, 3 Coil Mounting, Crocker-Wheeler Charging Generator. Nat Sauberman, 789 E. 163 Street, New York City.

ITS NOT VOLUME you want but DX and clarity. 4GL Radio Frequency Transformers do the trick. Made right; priced right. Savannah Radio Shop, 1223 East Duffy Street, Savannah, Ga.

USE "SIX-BY-SIX" UNITS to build any circuit you want—regenerative, super-regenerative, super-heterodyne or any other. Complete sets \$10 up. Catalog, hook-ups and information free. Radio Panel Shop, Junction City, Kansas.

BARGAIN: Two receiving sets; one Honeycomb, two step; Other spiderwebs, \$150 and \$50. Write for details to G. C. Schmid, 319 E. Wis. Ave., Neenah, Wis.

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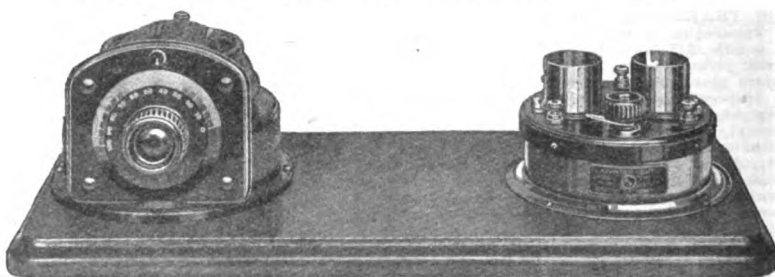
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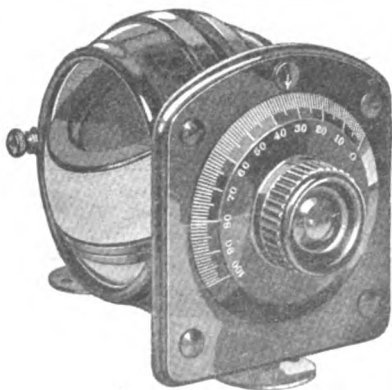
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and

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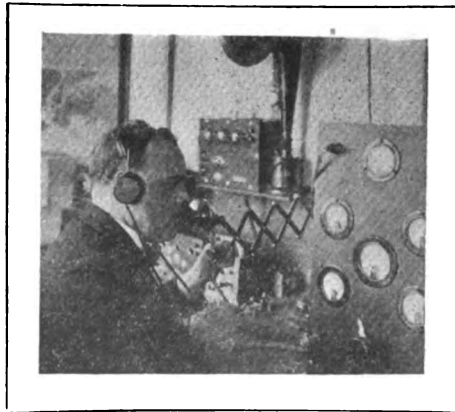
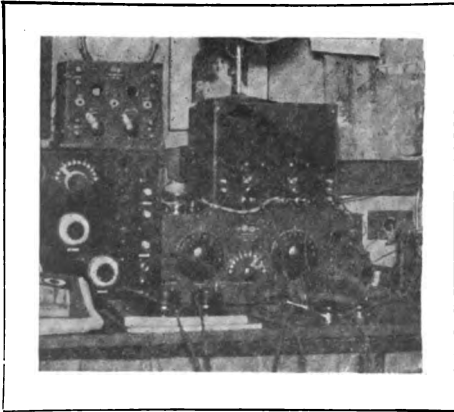
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Time on the morning of November 15, 1922, Mr. Harry H. Carman, 2EL, Freeport, Long Island, N. Y., and Major Lawrence H. Mott, 6XAD, Catalina Island, Cal., maintained two-way communication. The airline distance is approximately 2600 miles and is over land.

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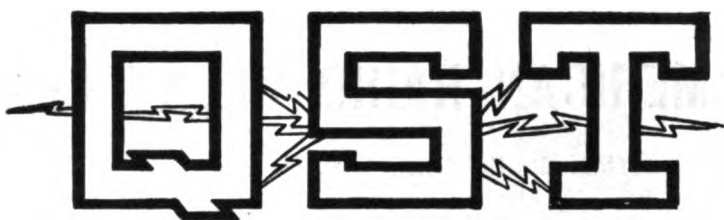
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The Official Organ of the A.R.R.L.

VOLUME VI

JANUARY, 1923

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

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The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radiotelegraphic communication.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a board of seventeen Directors, elected every two years by the general membership. The officers, in turn, are elected by the Directors from their number. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its Board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in America and has a history of glorious achievement as the standard bearer in amateur affairs.

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership; a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

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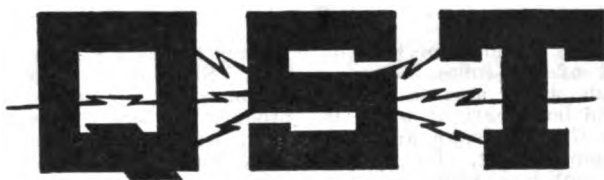
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A Magazine Devoted Exclusively to the Radio Amateur

Loop Transmission

By Leon W. Bishop, 1XP

At last! This is splendid material, especially when joined to 3ZY's loop receiving paper of page 27 of QST for April, 1922. We need every possible paper on 200-meter loop sending. Help us get them.—Editor.

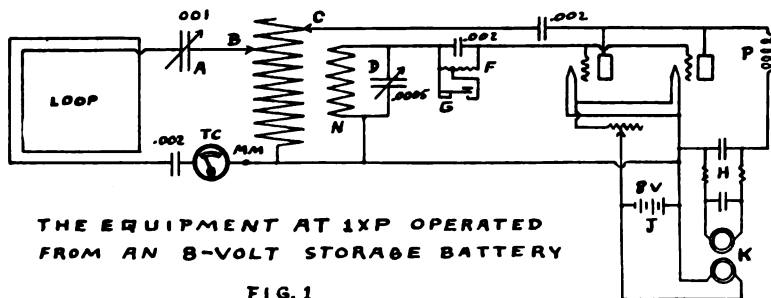
YOU fellows all read QST's recent editorial which said in effect, "Thou shalt not cause QRM between 7:00 and 10:30 P.M." It is up to us amateurs to dope out some way of handling short-distance traffic quietly. A sending loop seems to be the solution.

Last spring at the Boston Radio Show I was asked to equip an educational booth with a small transmitter to play music for the exhibitors. This I did, using a transmitter consisting of two 5-watt tubes supplied from an 8-volt storage battery and a 350-volt dynamotor and working into a loop consisting of two turns of No. 24 magnet wire on a 3-ft.-square frame.

The set developed a current in the loop of about 1.75 amperes and I was doubtful

people who had heard the music in various parts of the city; and finally we received four reports from a distance of 25 miles and one at a distance of 80 miles from New Hampshire. The loop showed directional characteristics, as the average distance in the plane of the loop was 15 miles, while 3 miles was about the limit to the sides.

Here is what will interest you fellows. While we were transmitting at 275 meters, exhibitors 20 ft. away were receiving WGI without any interference. Why can't we handle our local traffic in the early evening with loop C.W. transmitters and receivers? To do this we need no special equipment, only a low-resistance loop which is connected to the aerial and ground terminals of our regular transmitter thru series con-



if this would cover the hall, since Mr. Charles Kolster, the First District Radio Inspector, had agreed with me that the loop was nothing but a dummy antenna. We tuned to 275 meters and rushed around the hall to see if it was being heard. Everyone was receiving it nicely. A program was arranged and concerts started. Then the fun began. First someone from Wellesley, a distance of about 15 miles, called on the phone and asked us to repeat a number; then came reports in person by

densers. It is a good idea to keep the loop well away from the antenna lead, otherwise considerable energy will be put into the aerial by induction and our purpose defeated.

Since the radio show I have put in a large loop of low resistance at 1XP and have been able to transmit for a considerable distance. Figure 1 shows the circuit used. K is a 6-volt-to-350-volt dynamotor operated by a storage battery, J, which also lights the filaments of the tubes. H

is a filter to keep the commutator hum of the generator out of the tubes. *P* is a 150-turn honeycomb, which acts as a R.F. choke. *F* is a grid leak, part of which is shunted by a key *G*. *TC* is an ammeter for reading the loop current. Be sure to have a meter of sufficient range, as the loop current may be much larger than your normal antenna current.

The wave-length adjustment is obtained by varying inductance clip *B* and variable condenser *A*, which latter should be oil-

factory to key the plate supply or the grid leak. Since it is illegal to use a compensation wave, our keying must depend upon producing a slight change in the loop current, without altering the wave length. This may be done by shunting the key around a portion of the grid leak, as shown in Fig. 1. The point at which the grid leak should be tapped is that which will produce a 25% difference in loop current when the key is depressed. For example, if you get 1.5 amperes with the key open, you should get 2 amperes when it is closed.

We have tried a large variety of loops but have had best success with 2 turns of 1-inch copper ribbon spaced 3 inches apart on hard rubber strips, on a 6-foot frame as shown in Figure 2. The loop is supported by a silk cord and rotated by a shaft and handle extending down to the operating table. We have also had good results with a 3-ft.-square loop.

Here are some of the stations which have been worked in the last three months on the loop: 1OE, 1PT, 1ADN, 1ANQ, 1BGF, 1BKQ, 1CAK, 1CHJ, 1CMK, 1CNE, 1CSO, 2AEH, 2AWF, 2AZY, 3BX, 3BM, 3ANO, 3BIT, 8CCX, and 4EA. We got 4EA one night but have not been able to do it again, altho we have tried frequently.

At 1XP we also have a T antenna 40 ft. high and 106 ft. long, used with a counterpoise and a buried ground. The antenna current is 1.9 amperes, while the same set puts 3.4 amperes into the loop. We can work 900 miles with the antenna. The loop does not equal this but has covered several hundred miles. This takes patience and one DX record per evening is good work, but we can work 70 miles consistently if we are careful to turn the loop in the proper direction. The range could be increased by enlarging the loop and using fewer turns, but we would then approach the effect of an antenna with the consequent interference, and that is what we are trying to avoid.

Let us use this article as an introduction to a new field of amateur work, and compare our results thru QST in order that we may realize the maximum possibilities from loop transmission.

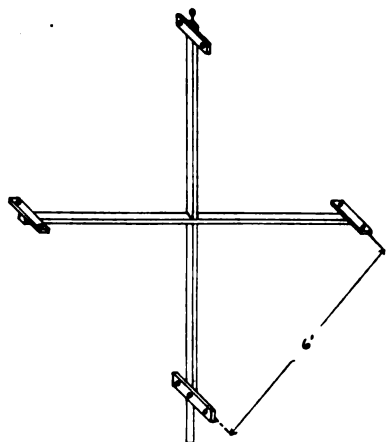


FIG. 2

immersed or liberally spaced. The plate clip, *C*, the grid tuning condenser, *D*, and the position of the grid coil, *N*, are then adjusted until maximum loop current is obtained.

To produce minimum interference it is desirable to use pure C.W. This of course demands more than ordinary care in filtering the rectified A.C. or the generator output. The smoother the plate supply can be made, the less likely the curse of the neighborhood is to fall upon us. Precautions should also be taken to avoid abrupt changes in the loop current by a method of keying which blocks any of the circuits. It is therefore unsatis-

1923 FASHIONS IN RADIO HAIRCUTS



For those who use a single headband



Or this - if a double headband is preferred



For those who like a close crop or shave, a few hairs left as phone locators are useful.



In Which We Get Across

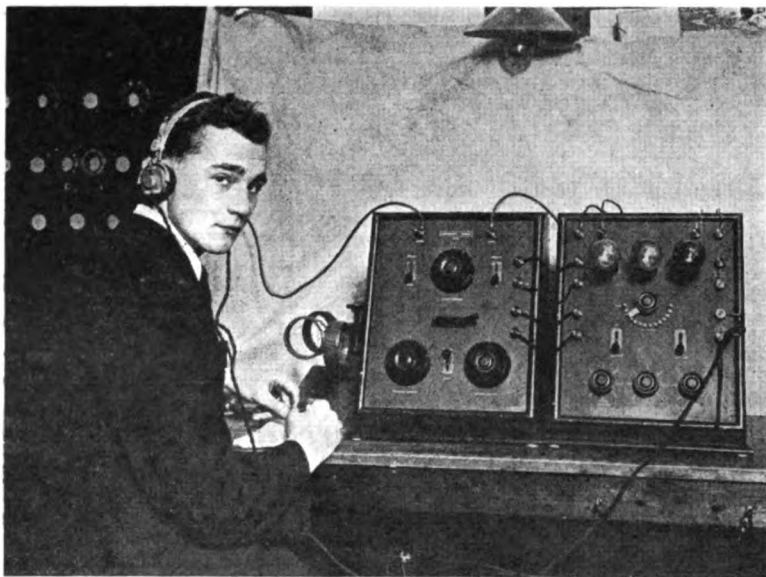
WELL, well well! We don't even need to have Transatlantic Tests to be heard in Europe. All we need do is prepare for them, and our comrades across the ocean copy us while we're trying to make our entry requirement of 1200 miles. During the preliminaries a total of 91 calls were reported informally to the Traffic Manager, and doubtless a great many others were heard.

Credit for the bulk of this reception belongs to the Manchester Wireless Society, a group of whose members, containing Mr.

remarks), 8CYB, 8IP (erroneously reported at first as 8IH), 8BO, 8NM, 8AMM, 8BXS, 8UK, and 9DVB.

On Nov. 23rd: 1BDI, 1BET, 1XM, 2ZL, 2ZS, 2AWL, 2BSL, 2BIC, 3BL, 3BFU, 3YK, 3ABY, 4EA, 4BY, 5BYD, 8UN, 8ATU, 9AAP.

On Nov. 26th: 1BES, 1BW, 1ZE, 1BDI, 1DC (erroneous; station not operated), 1GM, 1CN, 1XM, 2GK, 2AHO, 2CKN, 2AGC, 2AMM, 2BLP, 2AWL, 2BFU, 3JJ, 3AWY, 3WF, Canadian 3CO, 4BY, 4XC, 4ASP (obviously incorrect), 5TA, 5TJ, 8AQO, 8BEO, 8AD, 8AK, 8ATU, 8SP,



Mr. J. H. D. Ridley, chief test operator of Burndept, and the set on which he copied nine American amateurs during the Preliminaries. (Photo from World Wide Photos.)

Y. W. P. Evans, Hon. Sec'y of the British Wireless Relay League, Mr. W. R. Burne, 2KW, Mr. Allan Cash, 2GW, and three other gentlemen, rigged up a 7-valve receiver at the Society's station at Baguley, 5MS. This set used 3 to 5 radio amplifiers, a detector, and one stage of audio amplification. At our request Mr. Evans has radioed us the following lists of stations copied by them:

On Nov. 19th: 1GN, 1MK, 1BID, 2AJC, 2AJ, 2ZS (yes, Runyon is back!), 2GK, 2GV, 2CPD (originally reported in error in this country as 2CHD), 3XM, 3BLF, 4EL, 4EA, 4BY, 4DL, 6TF (see further

8CRB, 8ACF, 8AMM, 8BFM, 8MAP (obviously incorrect).

Mr. Leon Deloy, French 8AB, reports the reception at Nice of 1ARY's C.W. signals on Dec. 10th, calling a "3" station.

And on the early morning of Nov. 26th, London time, Mr. J. H. D. Ridley, Chief Test Room Assistant of the firm of Burndept, Ltd., Blackheath, London, copied nine American amateurs on a Burndept III using an extra stage of R.F.A., operating on an aerial 180 ft. long by 37 ft. high. Mr. Ridley's list consists of 1CMK, 1XU, 2AWL, heard calling 5LV and 9ZY; 2LM, 8BPL, sending a message to 4XY; 8ATF,

8AQO, calling British 5MS; 8XAK sending a weather report; and 9LG. And from 0105 to 0331 G.M.T. on that morning the entire program of WJZ was copied, the signals at some times being audible 12 ft. from the phones.

Fine business! Some of the calls look a little suspicious and one is inclined to believe that some of the numerals are twisted, especially between some 2's and 3's, but this is attributable to bum fists and perhaps will teach a lesson to some of our men—it is evident that if they send distinctly they will be reported correctly. We don't know quite what to think of the report on 6TF. It is queer that this call should appear when there are no other 6's, no 7's, and so few 9's. We have been told that the operator of 6TF was visiting an 8th district station at the time in question and was heard signing his home call on that set, but we hope that this is not true. Regardless of errors, however, the list shows that we are getting over this year in fine shape, and we only hope America will show as good reception when it comes her time.

The British amateurs are just as enthused as we are. 2KW writes the Traffic Manager as follows:

Springfield, Thorold Grove,
Sale, Cheshire,
21/11/22.

Dear Mr. Schnell:

Just a few lines to confirm the great news! You have heard it, eh what? I can scarce realize what has happened yet. But say, OM, isn't it just great? This has been the day I have been waiting for, and I hope we'll have some more like it only more so. Well, I'll give you a list of call signs we managed to log and you will receive a detailed log also under separate cover. But why do you fellows QRM so? It was the best exhibition of 600 meters that I've yet heard on 260 m.! It was just splendid to hear you fellows punching it away like that and be able to hear your little remarks. Anyway I should like to know if 4DL is "balled up" yet.

There were many more stations, some pure C.W., which we could not read, as 8CYB, 8BXS, 1BDI, 3BLF, and last but not least 2CPD, were kicking up such a shine. The last station readable 4 yards from the phones whilst the others varied up to R9. From 2:20 when we started up till 5:45 we were not without a good old American chap's noise in our phones. Sometimes we could hear five or six different stations going at once on nearly the same wave. These signals were copied at our new station in Baguley and I might say that it was the first occasion on which the station had been used. 2CPD has the honour of being the first station to be logged at Baguley by 5MS.

I shall be making another set and erect-

ing a special arial at 2KW very soon and it will be equipped as a further listening station. We mean to strain every nerve to make these tests a success and before you get this it is very probable that you will have received another cable or two.

Well, Cheerio and Good Luck.

Yours very sincerely,

W. R. Burne, 2KW.

P.S.: I enclose also a cover from QST which mag. was with us. We were so short of paper that I had to note 2CPD and 4EA and 8NM on it, so I've added the other sigs as we heard 'em and hope you will hang it up in your office as a souvenir!

FLASH—FINALS SUCCEED!

As we go to press with this issue, the official reports from France and Britain have just been received for the transmission of the first night, Dec. 11th.

Mr. P. R. Coursey, reporting for the Wireless Society of London, advises of the British reception of 1BGF, 1YK, 2EL, 2GK, 2NZ, 2XAP, 2ZK, 2ZL, 3ZW, 8AQO, 8AWP, 2BML, 2LY, 3BGT, 3HG, 3ZY, 4FB, 4OI (Porto Rico), 4ZS, 4ZW, 2ZS, 3XM, 4BX, 7PO, 8GQ, and the phone signals of 2ZK.

Dr. Pierre Corret, reporting for the French Committee, radios the reception in France on the first night of 8AQO, 1YK, 1BGF, 1BCG, 2XAP, 2ZK, 3HG, 1NX, 3FX, 2EL, 3HM, 2ZS, and the B/C fone of WJZ (hi!).

It looks like a boatload of Calls Heard before the tests are over! Big story in next QST of course; don't miss it.

—K.B.W.

Bureau of Standards Calls Standardization Meeting

The Bureau of Standards of the Department of Commerce has called a conference on radio standardization to be held on Friday, January 12, 1923, in New York City. This conference has been called at the request of the following organizations: Institute of Radio Engineers; National Radio Chamber of Commerce; Radio Apparatus Section, Associated Manufacturers of Electrical Supplies, National Retail Dry Goods Association; American Radio Relay League; and the Radio Corporation of America.

These organizations have pointed out that there is need for greater uniformity in the methods of describing, rating, and testing of performance of radio apparatus.

The purpose of the conference is to consider (1) whether a formulation of standards for radio apparatus and service shall be made, (2) What general classes of ap-

(Concluded on page 41)



10,000 Miles in 4 Minutes

ON November 22d 1AW of Hartford, Conn. sent a message via 9AWM at Sleepy Eye, Minn., to 6ZAC at Wailuku, Hawaii, and received a reply by the same route in four minutes and eighteen seconds. Think of that! It slashes all previous amateur records into small pieces. It makes our transcontinental record of six minutes and some seconds look utterly sick. Yet it was done without any preparation. No one stood by, no one helped, three stations did it entirely unaided.

On the morning of November 21st, Traffic Manager Schnell at the key at 1AW, the station of our A.R.R.L. President Hiram Percy Maxim, at Hartford, worked 9AWM at Sleepy Eye, Minn. 9AWM had previously worked 6ZAC in Hawaii and they arranged a date between 1AW and 9AWM in the hope that it might be possible to relay thru. About twenty-four hours later on the morning of November 22nd, 9AWM got in touch with 6ZAC at 4:00 o'clock Eastern Standard Time. Half an hour later 9AWM called 1AW. Mr. Schnell at once roused Mr. Maxim, who came down and took the key.

At 4:58:37 A.M. with "HPM" himself at the key of 1AW the following message left Hartford:

*Nr. 1 Hartford
6ZAC.*

*Clear and cold here tonight how
with you?*

Maxim.

At 5:00:32, 9AWM finished his acknowledgment to 1AW, and at 5:00:53 A.M. started the same message to 6ZAC and finished it at 5:02:10 A.M. Then there followed anxious minutes in the radio room at 276 North Whitney Street, Hartford, Connecticut. All of you can guess the

thrill that followed when at 5:04:40 A.M., 9AWM called 1AW and sent the following message:

*Nr. 1 Wailuku
1AW.
Fair and warm.*

Dow.

The total elapsed time for that message and reply was six minutes and thirty-eight seconds which is just eight seconds more than the time made in the transcontinentals of January, 1921, above referred to. As soon as the celebration had died down somewhat another message was started out. At 5:14 A.M., 1AW called 9AWM and started the following:

*Nr. 2 Hartford
6ZAC.
What time is it there?
1AW.*

That message was finished at 5:15:24 A.M., 9AWM acknowledged this at 5:15:25 A.M. and started it to 6ZAC at 5:15:45 A.M., finishing at 5:16:27 A.M. At 5:17:43 A.M., 9AWM called 1AW and sent the following message:

*Nr. 2 Wailuku
1AW.
Eleven thirty five.*

Dow.

This was acknowledged at 5:18:18 A.M., making the total elapsed time 4 minutes and 18 seconds.

Just think of it fellows! Four minutes and eighteen seconds! Let's repeat that. *Four minutes and eighteen seconds.*

And now let's look at the distances! Taken by air lines they are as follows:

1AW to 9AWM—1100 miles
9AWM to 6ZAC—3800 miles
6ZAC to 9AWM—3800 miles

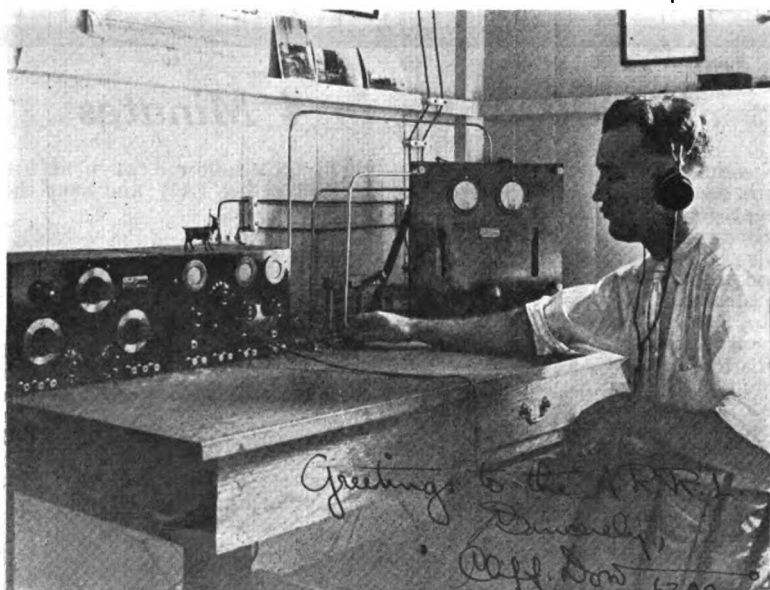
and finally, 9AWM to 1AW—1100 miles again.

A total of 9,800 miles for a message that started in Hartford on Wednesday November the 22nd, arrived in Hawaii on Tuesday, November the 21st, and came back again into Wednesday in Hartford and landed there only four minutes and eighteen seconds afterwards.

Not a bit of this was pre-arranged except the casual twenty-four hour date between 1AW and 9AWM; there was no special equipment used at any of the stations, just their ordinary transmitters. None of these transmitters were phenomenally large. A $\frac{1}{4}$ kilowatt tube worked below its rating

The complete little transmitter panel conceals two 50-watt tubes which are supplied with rectified A.C. Strictly speaking that is not correct, for one of those 50-watt bottles has cashed in and the record-making relay was handled on a single tube with 4.4 amperes in the antenna.

The antenna is a six-wire cage 90 feet high at the mast and slanting down toward the house. The counterpoise is composed of two small wire cages, one on each side of the antenna, and directly underneath it. The counterpoise is 35 ft. off the earth at the mast and 25 ft. off the house end. No ground connection whatever is used for either sending or receiving, the counter-



6ZAC and Its Operator

was used at 9AWM, a single 50-watt tube at 6ZAC and a quartet of little 5-watt bottles at 1AW. Let's have a better look at the sets themselves.

Mr. Clifford Dow, Hawaiian Division Manager, has in 6ZAC a station he may well be proud of for other reasons than its participation in the four minute Hartford-Hawaii-Hartford relay.

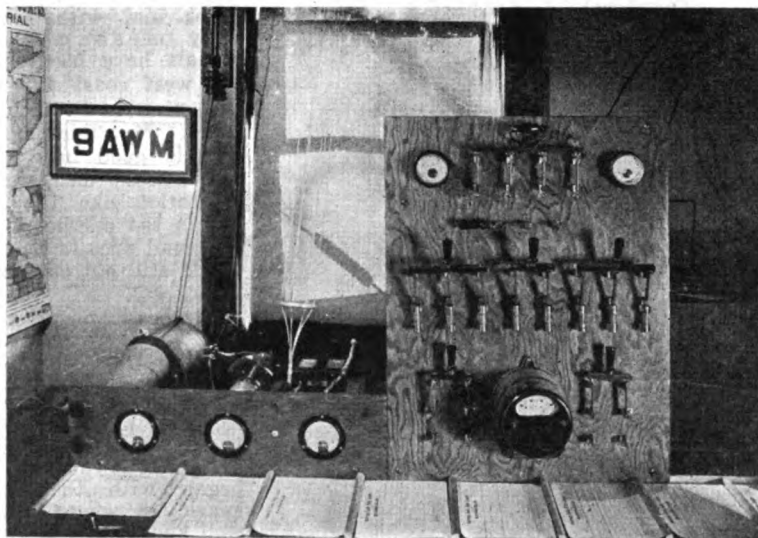
6ZAC is one of the stations that is helping to render obsolete our old traditions that a good station must always be in a wild mess. The photograph renders further comment on the station arrangement unnecessary.

The tuner is a single circuit "regen" with two-steps of audio amplification employing R.C.A. transformers and tubes.

poise being used in both cases. Both antenna and counterpoise are constructed of seven-strand No. 22 phosphor bronze. Unfortunately Mr. Dow was not able to supply us with photographs of the radiating system. The lead-in insulators are constructed of maple wood and have been boiled in linseed oil. The antenna insulation is of glazed porcelain. We are going after some more information about this for the antenna number of QST.

The bottom section of the mast is made of redwood 6" x 6" bolted to some redwood 6" x 6" stubs set into the earth. The next two sections are 4" x 4" and the entire mast has five sets of fence wire guys broken up with porcelain knobs. The mast is perfectly rigid and may be climbed with safety.

At present the Hawaiian Division con-



sists of 6ZAC and 6TQ in Honolulu. Mr. Dow says they have excellent conditions and that 6ZAC has a regular working range of 2300 to 3000 miles. The station has been reported in every district except the 1st and 4th and 6ZAC tuner's has heard stations in every radio district. The Hawaiian Division is turning in a nice traffic report this month. The present DX record of 6ZAC is 9AWM on 50 watts. Mr. Dow says that they do not brag about this and their only boast is that every message given to the Hawaiian Division is *delivered*. Come to think of it, that is a considerable boast and about 94% of the rest of this A.R.R.L. may take a lesson from it.

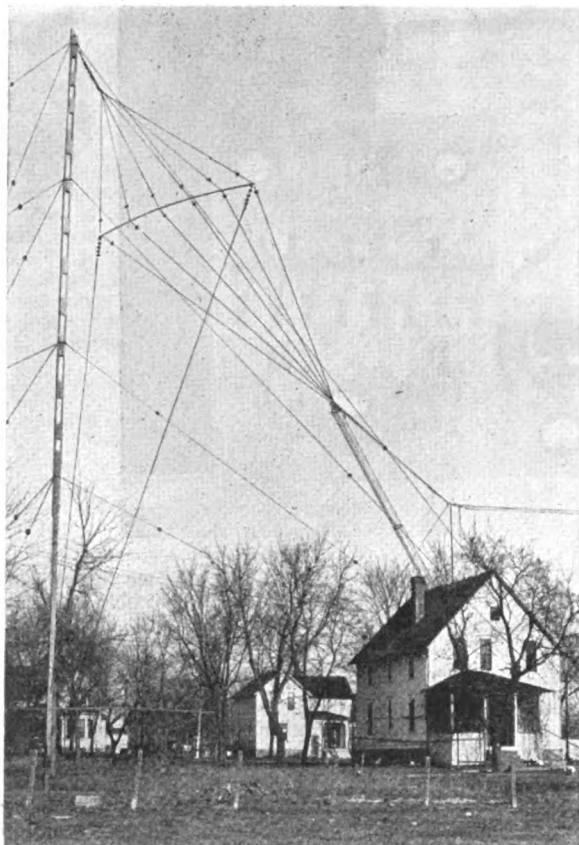
9AWM at Sleepy Eye, Minn., is constructed and owned by Mr. Lloyd Berkner and is about the prettiest thing in the way

of amateur tube sets that we have yet seen. Of course, after his participation in that unreasonable four-minute relay, we would praise 9AWM if it were an absolute junk pile. But fortunately it is a beauty instead.

The operating room is beautifully arranged. By running the receiving table at right angles to the transmitting table, everything is put within immediate reach of the operator. The receiving set almost explains itself. It is a three-coil set using spiderwebs instead of the more common honeycomb coils. The receiving antenna is a four-wire cage 3" in diameter which runs from the pole on the house and in the direction opposite to the sending antenna for 250 feet. More than detector and one step audio is seldom used.

The beautiful arrangement of the sending set is so utterly obvious that it seems needless to comment on it. The single U.V.-204 Radiotron, when operated somewhat below its rating, puts 8 amperes into the antenna. The circuit is a modified 1DH. The power supply is from an old 2200-220-volt 60-cycle transformer which has been reversed and whose output is rectified by means of a 64-jar chemical rectifier. A synchronous rectifier was formerly used but insisted on sparking and putting mush on the emitted wave, hence was discarded. The electrolytic rectifier requires care but it does the business in much better shape. The beautiful freedom from tangled wires, the systematic way in which message





The Antenna at 9AWM

blanks are filed, and the fact that the cage lead-in comes right down to the business end of the tube, are all in keeping with the general excellence of the set.

Long before the reader reaches this point the picture of the splendid antenna system will have attracted attention. It is a pathetic fact that Mr. Berkner has left us utterly in the dark as to its dimensions. Close inspection of the original photograph shows that much careful thought was put on its construction. The insulators in the different wires of the fan top are not at the same distance from the spreader but are so spaced as to make all the wires of the same length. The cage lead, as previously mentioned, goes clear down to the transmitting set. The counterpoise is much harder to make out, but unless we are badly mistaken it too has a cage lead which goes directly to the set. Just at this minute we would give about two dollars to know how tall that skyscraper mast is.

9AWM has worked the west coast thirty-five times, has 4 reports from distances over 4,000 miles, has worked 6ZAC ten

times and with him handled forty messages. 9AWM's signals have been reported on the west coast 125 times and the record distance is 4,600 miles. Mr. Berkner says that this is good luck. We must emphatically disagree with him. A station like 9AWM, though put in the middle of that famous dead spot in Scranton, Pa., would still put out fine distance work.

Traffic Manager Schnell began to operate Mr. Maxim's station, 1AW at Hartford, on the 20th of October with the intention of making a record for the number of messages handled in one month by one station if it could be done. He began with the famous old spark set whose voice was so well known at most points east of the Mississippi River, and was making good headway when on the second night the big high-speed gap at last went bad. To keep from breaking up the program it was necessary to get something on the air at once and a small C.W. set was hastily thrown together, using four 5-watt tubes supplied with rectified A.C. at 800 volts. Because this set could not be operated by remote control as had been the custom with the spark, it was necessary to place it in the operating room, to which the antenna was extended. As the

antenna had a large fan top (see cover and page 35 of July, 1920, *QST*) this raised the wave length so that it was no longer possible to get down to 200 meters. After one attempt at pruning the fan top, the big antenna was dropped and a single wire hurriedly run up to the top of one of the 80-foot masts. Altho the set was the most hurried sort of a thing and the antenna current but 1.8 amperes, this outfit handled 743 messages during the traffic month.

The single wire has been replaced by a tiny four wire cage run to the top of one of the masts just as was the single wire. This cage is exceedingly slender—only about $2\frac{1}{2}$ inches in diameter—but has been doing rather good work.

This same set handled the Hartford end of the record-breaking relay. It is not permanent and is accordingly not shown here. The showing of the little set was however so good that Mr. Maxim says the voice of the spark set at 1AW will not be heard again. When a change is made it will be to a permanent tube set.

—S.K.

Vacuum Tube Amplification

By S. E. Anderson*

A Paper Presented Before The Radio Club of America, Columbia University, New York, December 1, 1922

EVERYONE in any way associated with radio, excepting possibly the very newest of the new radiophone listeners, is more or less familiar with the manifold applications of the vacuum tube, in all of which it contributes in generous measure to make radio what it is today.

Probably more vacuum tubes are used as amplifiers of one sort or another than in any other capacity, such as an oscillator, modulator or detector. Indeed, a vacuum tube could not be an oscillator were it not first an amplifier, which has been pointedly, though somewhat inaccurately, described as something into which one puts nothing and gets out a lot of things he didn't expect. Modulation and detection are special modifications of this amplifying characteristic. By far the largest application of vacuum tube amplifiers, from a numerical standpoint at least, has been in the telephone repeater. It is this which has made transcontinental telephony possible and it has

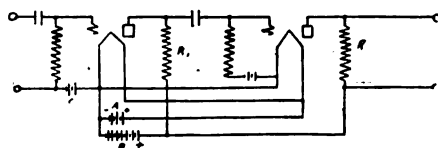


FIG 1
RESISTANCE COUPLING.

also enabled us to put in compact underground cables the telephone circuits between large cities, such as New York and Chicago. The number of telephone repeaters in a single office, such as Newark, may run well into the hundreds and the vacuum tubes necessary for these repeaters would keep the amateurs stocked up for some time to come.

But we are interested in amplification as applied to radio. I am going to assume that we are all sufficiently familiar with the "bottles" to enter at once into a discussion of the circuits in which they are employed as amplifiers. Before taking up in detail the various types of amplifiers as distinguished by the frequency range in which they operate, let us first consider the three general types of amplifier circuits.

*Engineer, Western Electric Co.

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We first have the "resistance-coupled" amplifier as shown in Figure 1. This was possibly the first type of coupling to be employed and is still used extensively for some purposes. The resistance R_1 is of the same order of magnitude as the internal impedance of the tube, or from 10,000 to 50,000 ohms. This means that the plate

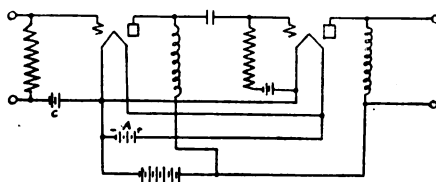


FIG 2
IMPEDANCE COUPLING

potential is about half the "B" battery voltage and this excessive battery waste is the chief disadvantage of this circuit. Another disadvantage is that the fraction of the pulsating voltage developed in the plate circuit of the first tube which is impressed on the grid of the second tube is proportional to the coupling resistance and if we make this small to save "B" battery we decrease the amplification. Making this resistance equal to that of the tube simply represents a reasonable compromise and with coupling resistances of this value the voltage amplification for each stage is obviously half the amplification constant of the tube. A minor disadvantage is that a condenser and grid leak are required for each tube but this is also true of impedance-coupled amplifiers. The big advantage of the resistance-coupled amplifier is that it

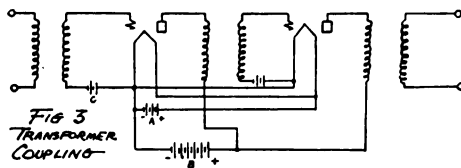
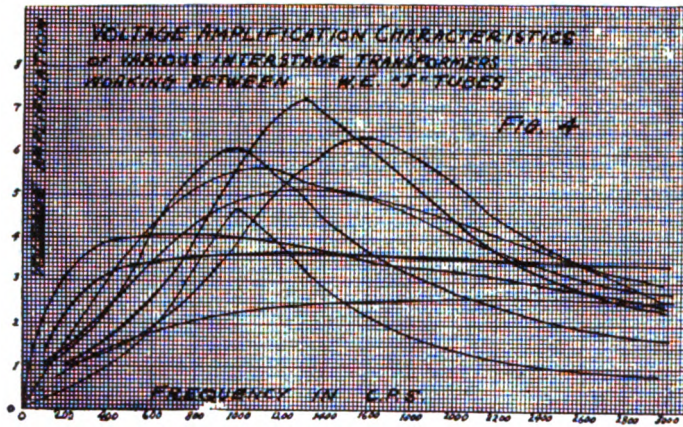


FIG 3
TRANSFORMER COUPLING

is practically independent of frequency up to the lower radio frequencies of 20 or 30 kilocycles. Here the efficiency begins to decrease rapidly and at a frequency of 1000 kilocycles, corresponding to a wave length of 300 meters, the amplification with ordinary tubes is exceedingly small.



Audio Frequency Amplification

It is natural that amplification at audio frequencies should be the first to be developed, both because of the relative simplicity of the task and because there are numerous applications of the vacuum tube amplifier where only the lower frequencies are involved.

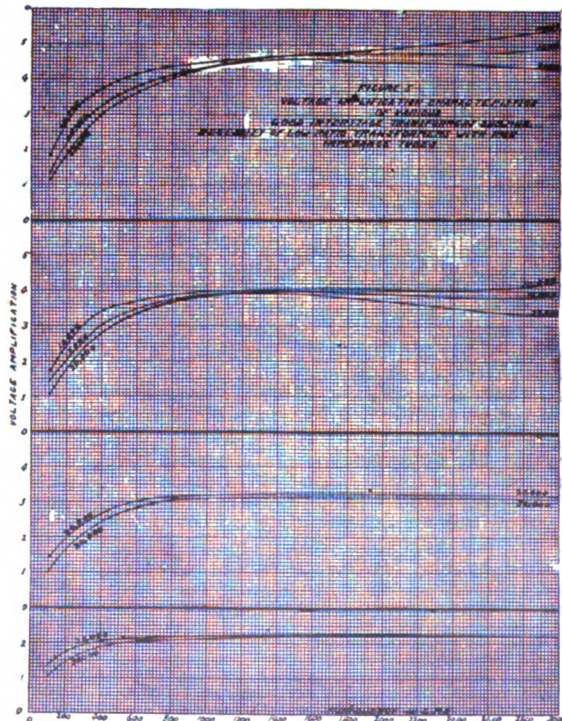
For very special purposes where it is desired to have uniform amplification over a wide range of frequencies, say from as low as 10 cycles per second to as high as

10,000, the resistance coupled amplifier is used. For this purpose, in order to overcome the inherent inefficiency of this method of coupling, a tube having as high an amplification constant as possible is usually employed. One standard tube used for this purpose has an amplification constant of 30, this being adopted after a tube with an amplification constant of 40 had been found impractical.

An "impedance-coupled" amplifier is shown on Figure 2, in which the resistances of Figure 1 are replaced by inductances whose value depends upon the frequency at which the amplifier operates. Until recently this type of amplifier was used for audio frequency amplification where it was desired to cover a wide range of frequencies without the battery waste of the resistance coupled amplifier, as the D.C. resistance of the choke coils is comparatively small. Recent improvements in transformer design, however, make it possible to get a very good frequency range with much greater amplification, as it is obvious that in an impedance-coupled amplifier the amplification per stage can never exceed the amplification constant of the tube unless resonance occurs, which destroys the desirable frequency characteristic. The impedance-coupled amplifier is used to some extent for radio frequency amplification, but even this use is declining as we learn more about transformers because of the extra apparatus—condensers and grid leaks—required by the impedance-coupled amplifier.

An amplifier using transformer coupling is shown in Figure 3. This type of amplifier is coming more and more into general use for several reasons. *First*, by means of a step-up transformer an amplification of several times the amplification constant of the tube may be obtained at moderate frequencies. *Second*, it is economical of plate battery. *Third* the frequency characteristics may be made as good as those of an impedance-coupled amplifier at all frequencies. *Fourth*, the grid condenser and grid leak are eliminated.

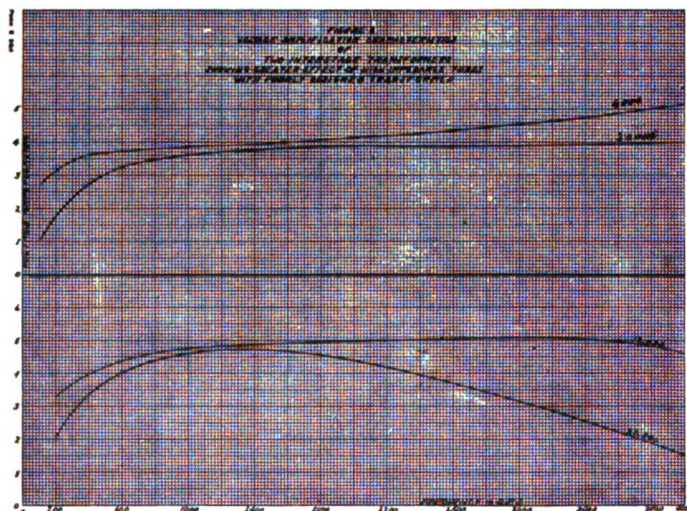
It may be well to point out here that a high amplification constant does not neces-



sarily mean a superior tube. For most purposes the excellence of a vacuum tube, aside from those general points of construction which tend to increase the stability, uniformity and life, is measured by a factor called its "mutual conductance," which is proportional to the change in plate current caused by a given change in grid voltage. Probably the most desirable amplifier tube from all standpoints, except use in a resistance coupled amplifier, is an oxide-coated filament tube having an amplification constant of about 5 and a plate impedance of about 6000 ohms. The tube with an amplification constant of 30 has a plate impedance of 60,000 ohms, so, although the voltage amplification is higher, the mutual conductance is only 6/10 that of the 6000 ohm tube.

former-coupled amplifiers, let us consider what is necessary in a good audio-frequency amplifier. The audio frequencies, or those frequencies which produce audible sounds, range from about 16 cycles per second to about 16,000 cycles per second. The lower limit is rather definite, as below this frequency the ear perceives the sound, not as a single low note, but as a series of sounds close together. The upper limit varies with different persons and with the same person under different conditions. Almost anyone can hear a frequency of 10,000 cycles per second and a few people can hear as high as 18,000 or 20,000.

In connection with ordinary telephone apparatus it has been found that for the transmission of good understandable speech it is necessary to use only the frequency



Impedance-coupled audio frequency amplifiers, as previously pointed out, are practically obsolete, though some splendid multi-stage amplifiers of this type have been built. The writer recalls one four-stage amplifier using tubes with an amplification constant of 30 and choke coils having an inductance of 350 henries with a minimum distributed capacity. At a frequency of only 80 cycles per second the impedance of such a choke coil is approximately 175,000 ohms, with the impedance at other frequencies in proportion. This impedance being three times the tube impedance, 75% of the plate voltage at 80 cycles is impressed on the following grid, so that the amplification per stage is nearly equal to the amplification constant of the tube over a wide frequency range. Incidentally the total voltage amplification of this amplifier was approximately 800,000 times.

Before considering in some detail trans-

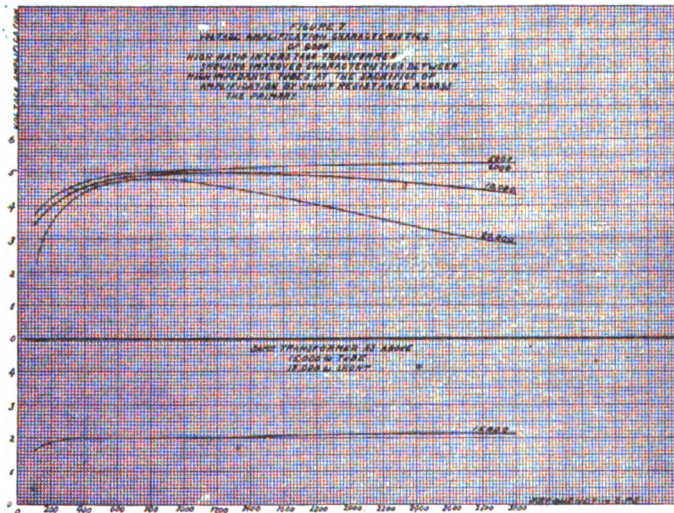
band from 200 to 2000 cycles, and the first radio transmitters were designed on the same basis. It was soon found, however, that music transmitted by means of these sets had an undesirable "tin pan" effect due to the absence of the higher and lower frequencies. It has been found that to transmit good quality music the frequency band must be extended to include all frequencies from 100 to 4000 cycles, and if it is desired to transmit perfectly such music as is produced by a large organ, the lower limit must extend down still lower to about 30 cycles. Not only must all frequencies within this band be transmitted, but they must, within limits, be transmitted uniformly so that the amplitudes of the various frequencies in the emitted wave correspond to those in the original sound wave.

Obviously it does us no good to transmit nearly perfect music if the receiving apparatus amplifies some frequencies with-

in the desired band five or ten times as well as other frequencies. This is exactly what happens with many of the amplifying transformers on the market. In Figure 4 are shown the characteristics of a number of these transformers, the amplification shown being that of the transformer alone when working between Western Electric "J" tubes, which have an output impedance

the lower the transformer ratio the more uniform is the amplification when working out of this impedance. When the impedance is increased to 30,000 ohms, the superiority of the lower ratio coil is obvious.

Merely making the ratio low does not suffice, however, though it is much easier to make a good low-ratio transformer than



of about 15,000 ohms. Of these transformers only two could be considered satisfactory and one of these falls off too much at high frequencies.

The maximum amplification of any transformer represents approximately its turn ratio. It is worthy of note that all the transformers having a ratio higher than 4 are very poor, while only one having a ratio less than 4 is bad and it is not nearly as bad as the others. It has been found by experience that a ratio of 4:1 represents the maximum which can be used and still give uniform amplification, and this is too high for most tubes.

On Figure 5 are shown a number of transformer characteristics representing the most advanced design. The upper curves are of a transformer having a ratio of 4.75:1 working out of the impedances shown on the curves. Comparing these with the curves below which are of a transformer having a 4:1 ratio, it may be noted that the difference in characteristics caused by using tubes of different impedances is much more pronounced in the higher ratio transformer. The same is true, to a lesser degree, of the two lower sets of curves showing transformers having a 3:1 and 2:1 ratio. There is one value of tube impedance—20,000 ohms—common to all the curves and it will be noted that

a good high-ratio one. At the bottom of Figure 6 is shown a poorly designed transformer having a 5:1 ratio working out of a 10,000 ohm tube. This transformer is very fair with this tube, but out of a 20,000 ohm tube it is most unsatisfactory, though not as bad as some of the transformers on Figure 4. The upper curves of Figure 6 show a well designed transformer with a 4:1 ratio and the excellence of the characteristic when working out of a 6000 ohm tube, the amplification being both high and uniform, emphasizes the desirability of using low impedance tubes. It is to be noted, however, that even with a 20,000 ohm tube this transformer is much better than the other, though not as good as a lower-ratio coil would be. This transformer was designed to amplify the higher frequencies more strongly and actually continues to do so up to 6000 cycles in order to compensate for the fact that the average loud speaker discriminates strongly against these high frequencies.

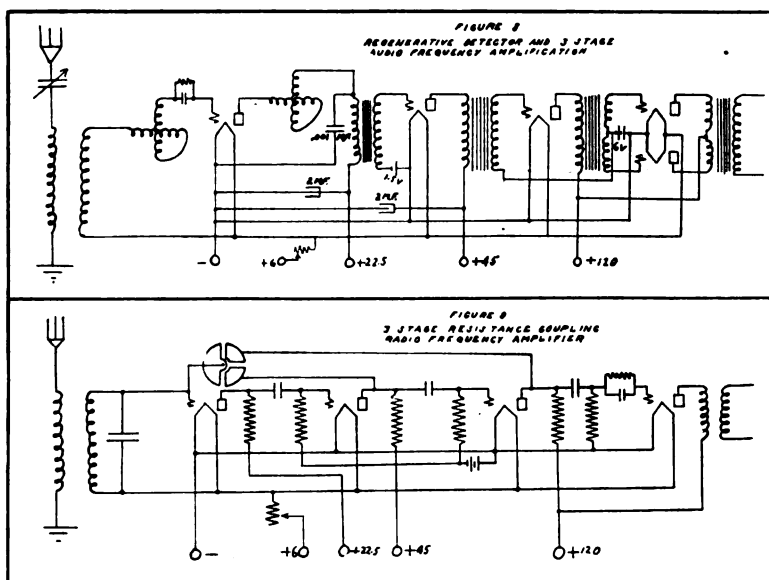
If one has a high-ratio transformer which is being used with high impedance tubes, and it is suspected of amplifying the frequencies around 1000 cycles more than the others, the characteristic may be greatly improved at some sacrifice in amplification by connecting a shunt resistance of 10,000 or 15,000 ohms across the primary or plate

winding. The results with one transformer which was designed only for low impedance tubes are shown in Figure 7.

The writer is glad to be able to say that a number of the transformers made by reliable companies have very satisfactory characteristics. It should be remembered that a good audio frequency amplifying transformer having a turns ratio of more than 4:1 has never been produced except for very low impedance tubes. A transformer having a 3:1 ratio is a very good compromise when working with most of the amplifying tubes available. It would be a good plan for the manufacturers to furnish, either in their advertising or with the transformers, curves showing their characteristic with moderate accuracy so that the transformers could be intelligently selected to work to the best advantage with the tubes available.

In Figure 8 is shown a standard two-variometer regenerative receiver followed by three stages of audio frequency amplification, which is the maximum number

The circuit of Figure 8 differs from the circuits usually employed in three details. *First*, grid biasing batteries are used on the amplifier tubes. *Second*, audio frequency by-pass condensers are used across the plate batteries. *Third*, the last stage of the amplifier uses two tubes connected in a balanced or push-pull circuit. If it is desirable to obtain the best possible quality, all of these changes from the usual circuit will be found well worth while. One thing that should always be borne in mind when building cascade amplifiers intended to produce a large output and which is very seldom considered, is that the available power in each stage should be greater than in the one preceding it. Speaking in terms of the tubes available to the amateur, suppose we have a U.V.200 as a detector, it is well followed by a U.V.201 with 45 volts on the plate as an amplifier. The second stage should be a U.V.201 with 120 volts on the plate and the third stage should use two U.V.201 tubes with 120 volts on the plate. It should be remembered that the



which should ever be used by the amateur. Indeed, the elimination of the second stage, leaving only two stages, is quite desirable when used with a regenerative receiver because it is very easy to ruin the quality by overloading the amplifier. For the large loud speakers used outdoors as many as nine stages of amplification may be employed, the last stage using four 50 watt tubes. Such an amplifier, of course, is far beyond the needs of the amateur and requires very careful shielding and balancing to prevent howling.

plate impedance of a tube decreases with an increase of the plate battery voltage. For ordinary purposes the use of 5 watt tubes in the last stage will be unnecessary and undesirable unless they are used with much less than normal plate voltage, say not over 150 volts, as it is very easy to overload any loud speaker with a small horn. For the first stage a grid battery of 1.5 volts will be satisfactory and for the last two stages 6 to 9 volts may be used.

It may be pointed out here that more than one stage of audio frequency ampli-

fication will not increase the sensitivity of the set. It will merely increase the output of signals which a detector and one stage will bring in. The reason for this is that the output of the detector is proportional to the square of the input and there is a limiting minimum input below which the output is negligible and no amount of audio frequency amplification will make it audible. The minimum output, however, while it can be heard in the receivers, is distinctly below comfortable volume and one stage

increasingly important in the final stages and, in general, the grid connections are more sensitive than the plate connections. For a three-stage audio frequency amplifier shielding between stages should not be necessary if the cores of the transformers are grounded. The outside connections of the transformer windings should be connected to plate and grid for maximum amplification, but reversing some of these connections may cure a persistent howl which refuses to yield to more rational treatment.

Now, although it is desirable that the plate and grid wires be short, direct and separated from everything else, all the other wiring should be bunched closely together, including the leads to the low side of the transformers. From an alternating current standpoint, all of this wiring should be at ground potential and bunching it together helps to keep it thus by virtue of the capacity between the wires and the elimination of inductive loops, remembering that the inductance of a circuit is proportional to its area. This bunching of the low potential wiring is especially effective in high frequency amplifiers.

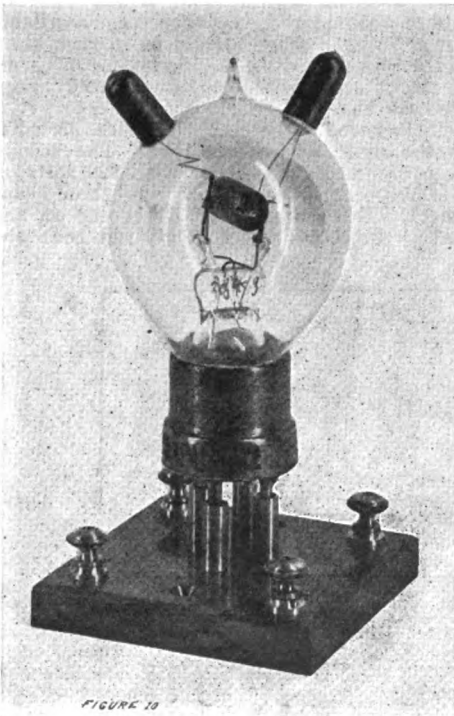
In view of the fact that one stage of audio frequency amplification actually does increase the useful sensitivity of a receiver and that additional amplification is useful only in connection with a loud speaker, it is recommended that one stage of audio frequency amplification be always embodied in a receiving set itself, while additional stages of amplification are mounted in a separate unit. If a regenerative detector and two or three stages of audio frequency amplification are embodied in the receiver unit itself, it is very difficult to eliminate undesirable howling and squealing.

Radio Frequency Amplification

Remembering the fact that the output of a detector is proportional to the square of the input, it is obvious that amplification of the signals before they reach the detector will produce most satisfactory results.

This is a very simple job for long wave lengths but it is a serious problem on wave lengths below 600 meters, corresponding to a frequency of 500,000 cycles. While the final solution has by no means been found, much progress has been made in the last year and very satisfactory results have been obtained. In all fairness, however, I shall have to point out that the claims of some manufacturers concerning the wave length range and amplification of their transformers are rather optimistic.

The fundamental obstacle in radio frequency amplification is the very high frequencies involved. At audio frequencies the input capacity of a vacuum tube—from 5 to 15 micro-micro-farads—may be entirely neglected, but at short wave lengths it becomes very important. At 200 meters,



of audio frequency amplification will, therefore, materially increase the useful sensitivity of the set. It is well to bear in mind that a signal gives about the same apparent loudness in a pair of "cans" on the ears when connected to the input of a two-stage audio frequency amplifier as is produced on a loud speaker connected to the output and used in an average sized room.

Just a word regarding the circuit layout and we will pass to radio frequency amplification. There is no better layout for amplifiers of all kinds than the "long and skinny," but this is not always practical. In any type of construction adopted, however, the output should be as well separated from the input as possible. There are two wires in each stage which must be as short and direct as possible—the wires to the plate and grid of the tube. This becomes

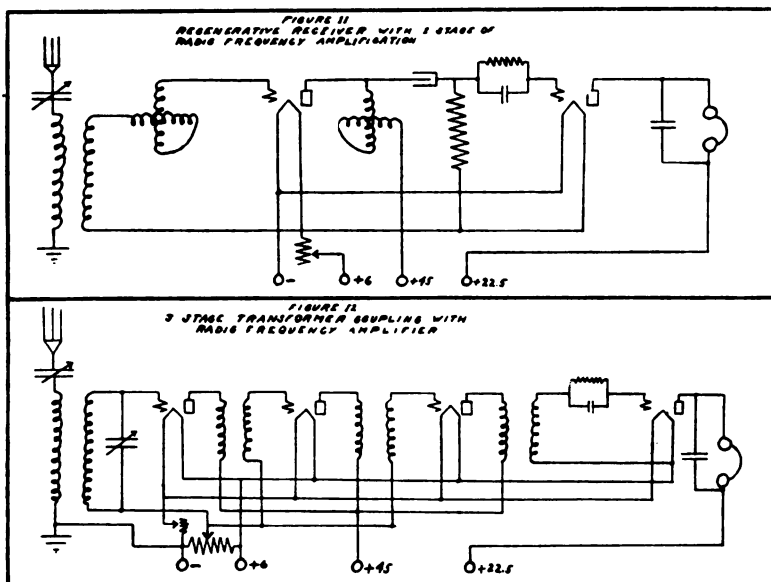
for example, corresponding to a frequency of 1500 kilocycles, the input reactance of the average tube in a good socket is only about 10,000 ohms, which is the same order of magnitude as the output impedance. Due to the effect of the output circuit on the input circuit, the input impedance of a tube with a high amplification constant may be reduced to as low as 2000 ohms. Unfortunately, the higher the amplification constant of the tube, the lower is the input impedance. These conditions make it necessary to employ some sort of resonance coupling, which uses the tube capacity in the resonant circuit to obtain a decent amplification, and this restricts the efficient wave length range to a relatively narrow band.

Let us consider first the resistance-coupled radio-frequency amplifier, which

This method of regenerative control is very satisfactory.

If one wishes to use half a dozen stages of resistance-coupled radio frequency amplification, it may be all right on 200 meters. It would certainly have the advantage of fairly uniform amplification over a wide range of wave lengths, the amplification increasing gradually with the wave length. But, in view of the fact that vacuum tubes cost more than a quarter apiece, most of us are content to use fewer vacuum tubes to get the same amplification for a smaller wave length range.

Some special types of tubes have been developed in order to minimize the inter-electrode capacity. The Meyers audion is an example of this type of tube and should show materially better radio frequency am-



has been developed extensively in Europe where most of the work is at longer wave lengths. A typical circuit of a three stage amplifier used in France is shown in Figure 9. The chief point of interest is the "compensator." This consists of a three plate condenser connected as shown. As the capacity between the grid of the first tube and the plate of the third tube is increased, regeneration occurs and the circuit oscillates readily with further increase of this capacity so that the amplifier may be used for C.W. signals. Increasing the capacity between the first grid and the second plate reduces the regeneration and tends to neutralize any undesirable oscillating tendency due to the capacity of the wiring.

plification in a resistance-coupled circuit. Figure 10 shows a photograph of a French tube developed for this purpose. It is popularly called a "Kamerad" tube because its arms are in the air. The grid and plate leads are brought out through the two "horns" which are copper sleeves cemented firmly to corresponding projections of the glass bulb through which the connections pass.

Even with these specially-constructed tubes resistance-coupled amplifiers have proven most unsatisfactory for wave lengths below 500 meters and practically all recent developments in this country have been in the direction of tuned interstage coupling. With this type of coupling the

capacity of the tube is used to resonate the coupling coil or transformer at the wave length for which the maximum amplification is desired and thus a fairly large capacity up to about 15 m.m.f. is not a disadvantage. If this capacity is further increased, however, such as by careless wiring or poorly designed tube sockets, the interstage tuning will become very sharp and the wave length range of the amplifier will be exceedingly limited.

At this point the writer desires to call attention to a very satisfactory method of adding one stage of radio frequency amplification to the type of regenerative receiver using a tuned plate circuit. The tuning may be either by a variometer or a coil and variable condenser. The circuit using a variometer, which will generally give better amplification, is shown in Figure 11. This circuit has been published in a number of magazines but has not received the attention it deserves. We have here the very best type of coupling for radio frequency amplification and its use adds no adjustments to the receiver. When adjusted so regeneration occurs the impedance of the tuned plate circuit is very high and the coupling is very efficient. A multi-stage amplifier using the same type of coupling between each stage would be an excellent amplifier except for the difficulty of tuning so many interstage circuits and the impossibility of obtaining a suitable circuit that did not oscillate. The addition of one stage of radio frequency amplification to such a regenerative circuit requires only one tube, a few accessories, and minor changes in the existing circuit. It will give a voltage amplification of about five or an increase in the detector output with weak signals of about 25 times. Surely this is very much worth while.

We will consider briefly impedance-coupled radio frequency amplifiers. They have one big advantage which is of considerable importance. Choke coils having moderately sharp characteristics may be used and the number of turns and consequently the wave length range may be changed by means of a simple switch. The switches of several stages may be mechanically interconnected, thus requiring only one adjustment. By tuning each stage rather sharply excellent selectivity is obtained, but, although the amplification in each stage may be fairly high, it is necessary to throw most of it away in some sort of "stabilizer," which has more properly been termed a "losser" by one of my associates, in order to prevent oscillation. This is because with the sharp tuning we have grid and plate circuits tuned to nearly the same wave length with the capacity of the tube for feedback, and at a million or more cycles there is no better oscillator than this combination. A minor disadvantage is the necessity for grid leaks and condensers, the capacity of which to ground is serious at radio frequencies. In general, the imped-

ance-coupled radio frequency amplifier will give somewhat less amplification but greater selectivity than an amplifier using flat resonance transformers and to cover the same wave length range will require an additional adjustment.

A three stage transformer-coupled radio frequency amplifier using a stabilizer is shown in Figure 12. The stabilizer could probably be replaced with profit by the "compensator" of Figure 9. Certainly the latter is much to be preferred from a mechanical standpoint, though there is some difference of opinion as to which arrangement gives the best regenerative control. The stabilizer functions by making the grids of the tubes more or less positive with respect to the filament, as when the grid becomes positive over a portion of the cycle current flows and power is consumed, thus placing a sufficient loss in the circuit to prevent singing. The compensator, operating as it does by merely changing the phase of the feedback potential, seems to the writer a much more rational solution of the problem.

The best solution of all is to design the circuit so stabilizers, compensators or other "lossers" are not necessary. It is possible to do this with a two-stage radio-frequency amplifier and we are not convinced that it is impossible for three stages, though it has not been done yet. It simply means the painstaking elimination of parasitic feedback capacities and inductive loops. Make the grid and plate wires short, straight and clear. Make all the other wiring as direct as possible, but bunch it together. After an amplifier is obtained which is free from singing or oscillation, a regenerative control, such as the compensator, may legitimately be added, but we cannot consider that any amplifier represents a real solution of the problem if we have to decrease the amplification in some way to prevent our amplifier from becoming an oscillator.

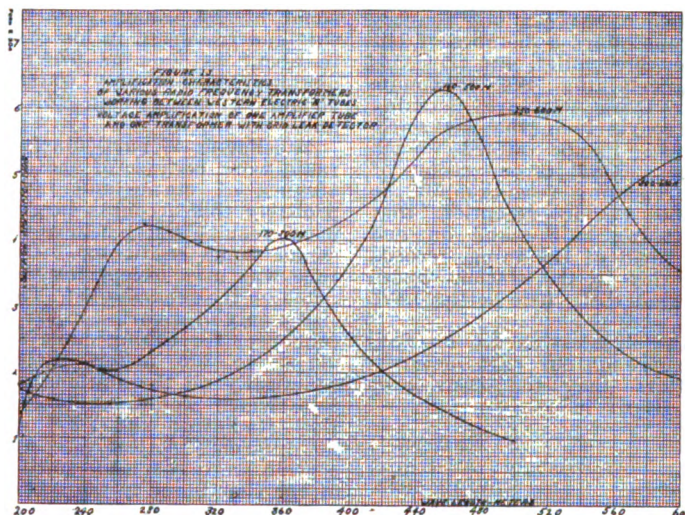
Now a word as to the amplifying transformers themselves. To the best of our knowledge and belief, no radio frequency transformer has yet appeared giving even approximately a uniform amplification over a much greater than 2:1 wave length range and the best transformer covers the wave lengths from 250 to 600 meters. Figure 13 shows the characteristics of a number of transformers with the rated wave length range marked on the curves. At the time the curves were taken measurements could not be made below 200 meters, but from the shape of most of the curves it was apparently unnecessary. Despite the fact that such a rated wave length range is obviously rather optimistic, the best of these characteristics represent fairly good transformers and, far from accusing the manufacturers of misrepresentation, the transformers actually do amplify over their entire rated wave length range, though

rather feebly at some portions of it. We honestly think, as with audio frequency transformers, that the characteristics should be made public by the manufacturers. The designing of transformers which are good at 200 meters merely awaits the lessening of the demand for transformers good at 360 and 400 meters. While

that obtainable by any other method—if one has six tubes.

Summary

We will summarize very briefly. For sensitivity, direct radio-frequency amplification should be used by all but millionaires. One stage of radio frequency amplification in a non-regenerative circuit gives

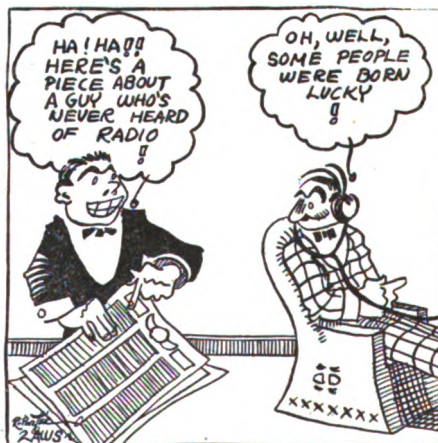


the best results at 200 meters will probably not be as good as the best results at 400 meters, the 200 meter results will soon be far ahead of the present 400 meter results. Improvements in design are constantly giving us an increase in wave length range without sacrifice of amplification.

It was previously noted that radio frequency amplification at long wave lengths was a very simple job. In fact, it is in some ways easier to handle the frequencies between 20 and 50 kilocycles than audio frequencies because the amplifier is tuned to the superaudible frequencies and tube noises are greatly reduced.

It has proven most satisfactory by means of a local oscillator and a modulating tube to change the frequency of the incoming signal to a much lower frequency. This may then be amplified to almost any desired degree without difficulty, the maximum practicable voltage amplification being about 10,000 times, which increases the final output 100,000,000 times. After amplification the signals may be detected just as if they were long wave signals. With a set of this type the weakest winter static sounds like a thunder-storm in the middle of July, so it would be foolish to build a more sensitive receiver. This type of receiver will probably remain the last word in sensitivity for some time to come. At least six vacuum tubes are required, but the sensitivity per tube is far ahead of

about the same sensitivity as a first class regenerative receiver. Two stages with good transformers will be about five times as sensitive as a simple regenerative circuit, and the regeneration in the amplifier will multiply this by about three. One additional stage of audio frequency amplification will bring the weaker signals up to a more comfortable volume. Additional stages of audio frequency amplification—never more than two—should be used only for operating a loud speaker, as they add nothing to the sensitivity of the receiver.



Trans-Pacific Amateur Reception

THE American amateur has made short work of spanning the Atlantic Ocean, which between our country and Europe offers a distance of but little over 3000 miles, and those interested in ascertaining the maximum range of their C.W. sets are listening anxiously for reports from the westward, where the broad Pacific affords much greater distances. QST is in receipt of several letters reporting reception all the way across the Pacific—reception that makes an amateur's hair stand on end with the sheer thrill of the thing, records that will bring joy to the station-owners who read here what their little bottles have done.

There's not the slightest excuse for further waste of space on our part in introducing the letters—they tell their own rousing story. Hr nr 1:

S. S. Easterner,
Brisbane, Australia,
Nov. 10, 1922.

Editor, QST:

The enclosed list gives the amateur stations picked up aboard this vessel during the trip across the South Pacific from Panama to Brisbane. Having been interested in amateur activities myself in the past, I took advantage of the opportunities for research in amateur reception on this trip and packed a small receiver of my own particular design in the hopes of hearing someone. The results, needless to say, are far beyond my fondest expectations.

You will note that in all 78 stations have been heard, practically all at distances greater than 3000 nautical miles. Bear in mind the difference between nautical and statute miles. Stations were heard over the entire trip, in the central states as well as the western, and some in the eastern states, the main obstacle in the latter case being the difference in time, which means that the eastern stations have all closed up for the night before it becomes dark out here.

Propagation and antipodal theories were nicely verified, it being observed that the most difficult distance to hear amateurs was just about 6000 miles, after which the waves again converge, and, on account of very little absorption over sea water, the signals again become louder. Twenty stations were heard over 5000 miles, 10 over 6000, and a couple over 7000. Of these, those deserving credit for being able to penetrate thru the 6000 mile circle are 6KA, 6CC, 6TI, 6BCR, 7SC, and 9ZAF. At 6000 miles 6KA comes in very loud and is with-

out a doubt the best station heard, altho 9ZAF comes very near the laurels on account of the intensity of his signals and the land traversed in his case. 7SC comes in about as loud as 9ZAF at the same distance but has only water to cross. It should be noted that 9ZN covered 5100 miles on I.C.W.

Mid-Pacific is particularly favorable for radio work because of the almost complete absence of static and interference, and probably this accounts largely for the unusual results, but I believe the receiver deserves some credit too. Only a detector tube was used except for the few stations noted on the separate list. The receiver consisted only of a vario-coupler and a variable condenser for tuning down from the ship's aerial of 300 meters fundamental. As practically all the stations were C.W., any tube which would oscillate did the trick. Both Radiotron and VT-1 were used with no difference noticeable. Attempts at reception were not made until well this side of the Canal, due to the severe static which paralyzes the set and makes reception impossible. The set was sufficiently sensitive, at any rate, that imperceptible static on the commercial tuner with one step amplifier becomes moderate, and induction from generator commutators in the engine-room becomes annoying. All the stations listed were heard more than once and verified, but occasional bad fists were encountered and it was almost impossible to guess what call was meant, in which case the one actually being sent was recorded rather than that which it seemed might be meant. On the whole I think most of them are quite accurate.

I have come in contact with several prominent amateurs in this city who informed that plans are under way for trans-Pacific tests with the Australians. Except for static and difference in time I consider reception of American amateurs here practically an accomplished fact already. The last night out of Brisbane, only 100 miles away, I heard dozens of stations in many districts and identified six of them. Static was unusually bad that night and many calls were partially obliterated. However, I expect to be in Australian waters for one or two months and shall endeavor to copy some stations in some of the ports to clinch the argument, altho Saturday night is about the only time as the amateurs work late enough then to be heard after dark in this country. The difference in time between California and Eastern Australia is 6 hours. As we progress further south conditions will obvi-

ously become more favorable, and I will inform you of later results.

Yours very truly,
R. E. Roesch,
Radio Operator.

Stations heard aboard S. S. "Easterner," detector only. All distances in nautical miles. United States dates.

Oct. 11—2000 mi. SW Panama—2FP (ICW), 6CC, 6ZX, 9BJI, 9OCV.

Oct. 14—2700 mi. SW Panama—5IA, 5JM, 5SF, 5TM, 5UK, 5UO, 5VI, 5VY, 5ZH, 6BQG, 6BUM, 6ZX, 7LU, 8BFX, 8BFX, 8BO, 8CF, 8ML, 8SP, 8ZZ, 9AMB, 9BCF.

Oct. 17—3400 mi. SW Panama—5EK, 6ADM, 6FT, 6KA, 9AFD, 9AJP, 9AOG, 9AUL, 9CKO, 9CXM, 9GK, 9XAC, 9XL, 9YAJ, 9ZN (ICW).

Oct. 19—3900 mi. SW Panama—5SM, 5UK, 6ATG, 6BUN, 6CC, 6EN, 6KA, 6PI, 6RD, 6XAD, 7ZF, 9AJP, 9CCV, 9ZN (ICW).

Oct. 20—400 mi. east Tahiti, Society Isds. — 5SK, 6BUM, 6BUN, 8SP.

Oct. 21—200 mi. south Tahiti — 5PX, 6AJH, 6APW, 6AWT, 6BCR, 6KA, 6XAD, 7SC, 7ZO, 9ANQ, 9AON, 9AWM, 9CPX, 9ZAF, 9ZN (ICW).

Oct. 22—3000 mi. E. Australia — 6AJF, 6KA, 6XAD, 7AD, (probably AD-7, Omaha; 7AD not working—Ed.), 9GK, 9ZAF.

Oct. 24—5 mi. east Raratonga, Cook Isds.—6AAQ, 6AD, 6ATG, 6KA, 7SC, 8BFM, 9AWM, 9AYS, 9BDS, 9KG, 9ZAF.

Oct. 28—500 mi. SE Fiji Isds.—6AVR, 6CC, 6GF, 6KA, 7SC, 9ZAF.

Oct. 29—1500 mi. east Australia—6BCR, 6CC.

Oct. 30—1200 E. Brisbane, Australia—6BCR, 7LR, 9AWM, 9ZAF.

Oct. 31—1000 E. Brisbane—6AK, 6AVD, 6CC, 6XAD.

Nov. 1—800 E. Brisbane—6EZ, 7SC.

Nov. 2—600 E. Brisbane, 6BCR.

Nov. 3—350 E. Brisbane—6TI.

Nov. 4—100 E. Brisbane, 5PX, 5QY, 6BCR, 6CC, 6KA, 9CXP. (Distance to San Francisco about 6800 statute miles; to Chicago about 8400 miles.—Ed.)

Also heard on Navy SE-143 tuner with 1 step audio amplifier:

Oct. 12—2250 mi. SW Panama—9YAK (spark).

Oct. 14—2700 mi. SW Panama—6ZZ, 9YAK (spark).

Details concerning any of the above reception may be obtained by writing to R. E. Roesch, 356 William St., East Orange, N. J.

Oh Boy! can you imagine that! Ama-

teur sigs running over a third of the way around the world! And here's a little more of the same:

S. S. "China,"
At Sea off Kobe, Japan.
Nov. 11, 1922.

Editor, QST:

Since my last letter in which I wrote you that we had heard several eastern stations while in the harbor of Honolulu, I have done some pretty good receiving while west of Honolulu.

Oct. 28—91 mi. W. Honolulu—6CC QSA 10 ft. fm. fones; 6AHR QSA all over room, cussing his MG set; 6TI; 9ZAF, Denver.

Oct. 29—361 mi. W. Honolulu—8YD,



East Cleveland, Ohio, "test de 8YD test de 8YD ex 8AGZ" etc., sigs QSA and good for another 1000 miles, distance approximately 5300 mi.; 6XAD; 5JH doubtful; 9ZN doubtful.

Oct. 30—650 mi. W. Honolulu—6TI.

Did not listen after the 30th on account of heavy induction from ship's generator. Last night while we were in Yokohama my partner suggested that we give the 200-meter boys a whirl for a few minutes. On listening in on the 2-step audio and single-circuit tuner, static fair but QRM mush from JAA arc. Didn't expect to hear anything but sure enough here comes some amateur from the States coming in good. But he was one of those birds who think it necessary to send 40 words per to get thru. I think he was calling 1BQM. As for the rest of it, ND—absolutely couldn't be done. We are both positive he was a "3" station but his call was all jumbled up in sending. You know the kind. When he sends it sounds like a new code has been invented. If he had been sending even stuff, I am sure we could have logged him. But no matter who that station was, it was an

American amateur using self-rectified A.C. C.W. and that American amateur was getting across the Pacific. (DX Yokohama to Washington, D.C., about 6800 statute miles.—Ed.)

I am positive the limit has not yet been reached with C.W. If you could have heard those signals as I did and heard their steadiness I know you would agree. I have been a commercial operator since 1912 but

voice was readable easily 4 feet from the phones. Also I have a letter of acknowledgement here from 9DJG, stating that the sigs I heard from him, and which check exactly with his log in every respect, were sent to me via the 5-watt route, using AC on the plate at that. Can you imagine that—4230 miles with an ampere of 30-cycle C.W.? And they give up the perfectly good ether to broadcasting! And again, 4EH, heard here during October, acknowledges and confirms, and tells me his transmitter uses three 5-watters, in the Sure-Fire circuit, using chemical rectified AC, 750 volts. Atlanta, Ga., across the U.S. and 2300 miles of ocean on 15 watts! It's about 5000 miles, roughly estimated. I wonder, if it's my receiver or their transmitters? I'm inclined to favor both, 50-50. But it seems I hear fellers like 9DJG, who have a previous DX record of probably 500 miles, and it must take a receiver. I logged stations in every radio district last month and sent QST the list. Have confirmations here this A.M. from 1XM and 2GK. Both came to me on 100 watts.

I'm going to get real QRW here now and junk my present transmitter and rebuild it into a decent, civilized, DX go-getter. I'm going to find some sort of a motor on this island and rewind it for DC hi-voltage. Have a chemical rectifier in now but having lotsa *pilikia* (Hawaiian for "trouble") with it lately. Last evening several of us here were listening at my house to the "all-star" concert being rendered by the Star-Telegram of Ft. Worth. He comes regularly here and was especially good yesterday from 4:30 P.M. on, about 2 hours before dark. KHJ, the Los Angeles Times, was also good and we alternated between them. Also 6XB was going strong, but punk modulation. He called me at 10 P.M. and sed he'd call me later and that 6ZAF would call; also that K. B. Warner was with 6ZAF. FB. I tried to raise 6XB and 6ZAF but tho they were both QSA here, they unheard me. However, 6ZAF sed to QRX for 6ZE's I.C.W. on 200, and we worked. Gosh, 6ZE was QSA, and he copied me fine single; sent one and received two QRQ from him. K.B.W. is going to work me from 6ZE at 11:30 tonight, and he'll have something interesting to tell when he gets back. Well, I sent 8 msg's. to 6BSA, with considerable difficulty thru the arc mush at his end, and at midnight here sed "GM" to 6AJF, using 15 watts, and as QSA as 6KA's 250-watter. That's a sample evening at 6ZAC. Sometimes I feel like logging, so I just twist the little dial and



I've changed my "Sweetie" and when I go back to the ranch I'm going to have an amateur C.W. set.

Hoping this letter will interest you, I remain

Respectfully yours,
Howard A. Cookson,
Operator.

And that isn't all the Pacific dope, at that, for here is some interesting accounts from 6ZAC on how the gang rolls in in Hawaii:

Wailuku, Maui, T. H.
Nov. 18, 1922.

Dear Mr. Maxim:

Yours of Oct. 31st just arrived, and many thanks for the cheering word, OM. Have heard the boys calling you night after night but cannot seem to find you. Mebbe there's a limit to this C.W. stuff....I dunno. I worked 6BSA several times lately on his 5-watter and he's a much better signal than lotsa the 50 and 100-watt stations. Last night he was audible 40 ft. from the phones on 2 steps on C.W., and by gum, he talked to me, TALKED, 2300 miles with his voice propelled by a dawgone 5-watter, for 20 minutes, and I didn't miss a word! If I wuz 9ZN I'd trade my 250-watt ICW for a real transmitter. 6BSA's

write 'em down fast as I can. Guess the boys get a real thrill from my reports of their sigs—every card and letter sez it's better'n a check. Hi! I sure enjoy the letters too, and I boast that every one is answered.

Say, when can we have the "Provisional" taken off our Division? I sent Schnell a traffic report of 133 messages handled for our 2-station division, and the QSO is 2300 miles at the shortest. And we have a dandy big C.W. station coming right along in Honolulu—6ZY. He gets mainland stuff fine and will be QSO coast soon.

Very best wishes, OM, and hope I can work you some day.

Sincerely,
Cliff. Dow.

What next? Gosh, we don't dare think! But we have a bird of an idea! Hasn't some rich A.R.R.L. member a steam yacht he'd like to lend us to send out on a long cruise thru the South Indian Ocean and the far-distant corners of the world, just to see where these sigs do go? We'll supply the operator and the set—but shucks, all he'll need will be one tube!

—K.B.W.

"The Amateur Is Doomed"

A message relayed from Hartford to Hawaii and return, 10,000 miles, in 4 mins. 18 secs. total elapsed time, a new speed record.

Over 50,000 messages handled in November, the greatest number ever reported.

About 80 calls heard in England during the Transatlantic Preliminaries, several times as many as in last year's Finals.

A flock of amateurs heard off Australia and China, at distances of 7000 miles.

Amateur radio locates and saves storm-bound trains, and gets recognition for its valuable services.

Are We Downhearted?

The Department of Commerce's 1922 Cup

HAVE you had a postcard from 5ZA recently? We say, have you seen the boy's card with the illustration of the cup which was awarded him by Secretary of Commerce Herbert Hoover himself, when the A.R.R.L. adjudged 5ZA the best all-around amateur station in the United States in 1921? If you haven't received Falconi's new postal, take a look at page 32 of November QST, where we tell all about it.

Now this is an annual trophy awarded by Secretary Hoover, under the auspices of the A.R.R.L., and it is time to award another

one for 1922. *This is a call for entries—they are now in order.* As we have said in QST before, Mr. Hoover desires that the cup be awarded primarily for the best amateur radio equipment in major part constructed by the amateur himself. This is typical of Mr. Hoover, who is an engineer and realizes that the greatest benefits come to any line of endeavor when initiative and individual effort in design and construction are encouraged. All necessary information concerning the matter is contained in the following extract from the original announcement in QST for January 1922. The

cup will be awarded to **AMERICA'S BEST ALL-AROUND AMATEUR STATION**, the major portion of which is home-made, as determined by a consideration of the following features:

- (A) Extent to which the apparatus actually is made by the amateur himself.
- (B) Ingenuity displayed in design, construction, and arrangement of the station.
- (C) Over-all electrical efficiency of the transmitter, as determined by test or supported by acceptable affidavits.
- (D) Consistent transmitting range thru the preceding year, as will be known to the Operating Department of the A.R.R.L. or determined by test.
- (E) Performance of the receiving equipment, as evidenced by the station log or determined by test.
- (F) Record of the station in obeying the Radio Communication Laws of the United States in every respect, and in complying with whatever local co-operative regulations are in effect in its community.
- (G) The quality of the "sending" of the operator, particularly as regards "readability," brevity, and the quality of judgment displayed in operating.
- (H) The amount of relay traffic handled in the preceding year, as will be known to the A.R.R.L. Operating Department.
- (I) Accuracy, completeness, and neatness of the station's log. A log must be kept and submitted as an exhibit in this contest. It will be returned to the owner.

Regulations

The following regulations shall govern the contest and awards:

(1) Any licensed amateur radio station in the United States or its possessions shall be eligible.

(2) The particular idea of this contest being to encourage original design and construction by the amateur himself, the greatest consideration shall be given to the extent to which the apparatus is "home-made," and stations in which the major portion of the apparatus is purchased ready-made shall not be considered favorably.

(3) The calendar year shall be the basis for the annual awards. To be eligible for any year's award, a station must be in actual existence on December 31st of that year, and its operation during the preceding year will be considered primarily with a view to determining how good a station it actually is. There will be an award each year for four years, the presentation to be made by the Secretary of Commerce on March 1st to the successful entrant of the preceding year.

(4) To enter a station in this competition the entrant shall file the following exhibits at the office of the American Radio Relay League in Hartford, Conn., not later than February 1st following the end of a calendar year:

(a) A manuscript containing a complete description of the station and its apparatus, particularly of those portions made by the amateur himself, and giving such data on features A to I hereinbefore referred to as



The 1921 Cup, Won By 5ZA

will likely be of aid to the Judges in determining the merit of the station.

(b) The station log.

(c) Photographs of the transmitting equipment, receiving equipment, antenna equipment, and such other photographs particularly of home-made features of the station as will assist the Judges in determining the merit of the station.

(d) Wiring diagram of the entire equipment, with constants.

(e) Sketches of any unusual equipment, if desirable.

(5) A Committee of Judges will be announced by the Board of Direction of the American Radio Relay League and shall take charge of the entries and determine the winner. Their decision shall be final.

(6) In determining awards, the Judges shall take into consideration the wave length and power allotted competing stations under their licenses.

(7) These regulations shall be subject to change up to Dec. 31, 1922, as regards the awards for 1923 and 1924; and up to

Dec. 31, 1923, as regards the award for 1924.

The race is now on. The Hoover Cup is the biggest honor available in amateur radio. We earnestly urge upon A.R.R.L. men the desirability of preparing exhibits covering their stations and sending them forthwith to Headquarters. Remember that a rich man's station hasn't a ghost

of a show in this contest—it is purely for the amateurs who build their own apparatus. If you have a pretty good station in which you made most of the apparatus yourself, we want your entry. Read carefully the features which count and the regulations, particularly paragraph 4 telling what should be submitted. Entries must be in by February 1st, so immediate action is necessary.

The Daylight Transcons--Preliminary Report

THE "preliminary" in the title could have been a "final" if everybody had come right across with complete logs. We suspect the following of having information and will be mighty thankful when it comes—1AWF, 1BRQ, 2BG, 2BLP, 2FC, 2AWH, 3BLF, 3LR, 3MB, 3PZ, 3OT, 3TJ, 3YI, 6AK, 7OT, 8BWA, 8CM, 8CUR, 9AMB, 9XA, 9XAD, 9XAQ. Of course there are a lot of others that are holding out on the gang as can be seen from the wide gaps in the report. What's the matter? No ink in the bottle? Come on and snap out of it.

Reports lacking essential details such as station calls, dates or hours, were received from 1AFP, 1QP, 3XM, 6ZX, and 8AXN. Now by way of pleasant contrast we got complete logs from 1BQD, 1KC, 2AJF, 2AWS, 2FS, 3ZO, 4AS, 4FT, 6CC, 7BK, 7TH, 8OAL, 8CTN, 8HJ, 8QK, 9ABV, 9APW, 9BRI, 9DCR, 9DJB, 9MO, and 9OX. And finally there was a small group of REAL A.R.R.L. ops that sent in logs properly tabulated and dated and which gave all calls, times, message numbers and message texts, and which arrived ON TIME. They rate a *Roll of Honor*:

1BES	2BLP	3AEV	3CA	3JJ
4FS	5XY	7LU	7ZO	8AGR
9AOG		9AWM		9CXP

Because of the general lateness and incompleteness of the reports the following is all that we know at present:

NOVEMBER 30th

Msg. Nr. 1 East

Supposed to have started in Northwest Division but never heard of.

Msg. Extra Nr. 1 East (unofficial)
From Walnut Grove California
To 1AW.

Congratulations of the West Coast.
6ZX.

No information as to starting point or route until 3:30 P.M., after which it moved 8ARG-1BES-1AZW-1QP-1AW, where it was delivered at 4:06 P.M. E.S.T. As far as we know at this writing this was the only successful message.

Msg. Nr. 2 East

From Walnut Grove, Calif.
To H. P. Maxim, Hartford, Conn.
Wire news if transcons a success.
Wise.

No information whatever as to route or place where this one died.

Msg. Nr. 3 East

From Denver, Colo.
To F. H. Schnell, care 1AW.
Glory to the doomed hams.
Hood.

This of course was not a transcon at all but was lost just as effectively and not a thing is known about it.

Msg. Nr. 1 West

From Worcester, Mass.
To Los Angeles, Calif.
Hope this makes the record.
1CPN.

Moved 1CPN-????-1QP-8CKN-????-1AWB-2AWS-2BG-???-3AAO-3PZ, also 3LR & 3JJ-8AIO-8CUR-????????????

Msg. Nr. 2 West

From Wilmington, N. C.
To 6ZK, Sunnyvale, Calif.
The amateurs of the Roanoke Division greet you.
Parsley 4FT.

Started at 4FT at 5 P.M.—a solid 8 hours late—which gave it only a fighting chance for arrival in daylight. Moved 4FT-3BLF-9OX-9DJB-9ABV-9AMB-6CC-6AK-6ZX—where it arrived at 5:50 P.S.T. The delivery to 6ZX was a mistake, as the msg. was not addressed to 6ZX but to 6ZK. Because of this and the fact that it traveled right in the sunset, this msg. must be rated as a failure.

Msg. Nr. 3 West
No information.

DECEMBER 3rd

Msg. Nr. 1 East
No information whatever available—not even msg. text or point of origin. Msg. probably never started.

Msg. Nr. 2 East
From Walnut Grove, Calif.
To Hiram Percy Maxim, Hartford, Conn.
Have you many sixes on your log?
Wise.

No information.

Msg. Nr. 3 East
From Denver, Colo.
To F. H. Schnell, care 1AW.
Watch our smoke.

Rocky Mountain Division.

No information as to early part of travel but after 10:00 A.M. C.S.T. traveled 9AMB-9ABV-9XAQ-9AWM-9DCR, but at the same time was handled by 9CCV, 9AEQ, 9CKP and 9APW, in a manner that is not sufficiently explained by the logs of those stations. Never arrived 1AW.

Msg. Nr. 1 West
From Lewiston, Maine
To George F. Dorner,
1611 Fern Road, Berkeley, Calif.
When do you start for here?

Linewood.

Moved-????-1AWB-????-3MB-???? and, at the same time, also 1BQD-2BLP-2FC-

2AWH—then missing till 4:20 P.M. C.S.T. when it turned up at 8AGR-8BWA-????-9AWM-9XAQ and 9BRI at 5:15 P.M. No further dope.

Because he suspected that Msg. Nr. 1 West was not getting started, Traffic Manager Schnell initiated another message:

Msg. Extra Nr. 1 West
From Worcester, Mass.
To 6ZX, Walnut Grove, Calif.

Your thanksgiving message received here at 4:06 P.M.

Schnell.

This traveled 1CPN-1KC-1AFP-???-1QP-2AWS-3XM-3ATQ—and then was lost.

Msg. Nr. 2 West
No information at all.

Extra Nr. 1 East of November 30th was the only msg. that made a bona-fide daylight crossing. It is probable, however, that some of the others got much further than the present spotty records show. The texts of the messages have been supplied for the information of those who may be confused as to the exact msg. they handled. Now PLEASE give us the complete logs of the wanderings of these incomplete msgs. so we can have a really good report next month. And in those logs for the love of Mike TABULATE the stuff and give all message-texts, hours, calls, the kind of time your clock reads, and the DATE you did the work on. Even if you did not do any sending, let's have the log if you heard anything happen.

A Snowstorm Emergency and the A.R.R.L.

ON November 4th a tremendous snowstorm swept down upon Wyoming and Colorado. With the snow came wind and sleet. By midnight the snow was fifteen feet deep in the cuts along the C. & S. railroad. Somewhere out in those drifts were train No. 29 of the 4th and train No. 30 of the 5th. No one knew where they were, for the ice-laden telegraph wires had gone down long ago. If the dispatcher at the northern end at Casper could only locate the lost trains it might be possible to do something for them. But neither telegraph nor telephone were available. It seemed possible that the C. & S. dispatcher at Denver might know. But between Casper and Denver all wires were down.

In the emergency the railroad turned to amateur radio. At about 2:00 o'clock in the afternoon on November 5, 7ZO was asked to attempt to reach Denver. It was

explained to the dispatcher that this could not be done in daylight so he waited until evening. As soon as darkness fell the air around Casper was thick with C.W. signals. How many hundred times Denver was called not even the log books will show. Denver did not answer. A ground on a high voltage line was creating such an uproar that no one in Denver was able to copy anything. Finally at 11:30 P.M. 9ANQ, L. V. Wells at Kansas City, Kansas answered 7ZO's calls. It turned out that he probably could reach Denver by wire and he was at once given a message from A. W. Parker, the Casper dispatcher of the C. & S. R.R., to W. P. Wilson, the chief dispatcher of the C. & S. at Denver. The message requested information as to the whereabouts of the lost trains, stated that drifts from five to fifteen feet deep blocked the right of way, and finished "It does not seem possible to get No. 29 thru. Advise

if you wish help from Northern end." 9ANQ at once telephoned this message to the railroad wire operator of the Chicago, Burlington and Quincy Railroad at Kansas City, Mo. But that operator was completely hardboiled. He flatly refused to believe that a radiogram regarding the matter could have been received. He had evidently been born somewhere in the sixth century and had never gotten up to date. Everything possible was done but this dumbbell refused to take the message. Wells sadly got back on the key at 9ANQ to see what could be done about it and had the good luck to pick up AD7 at Fort Crook, Omaha, Nebraska. AD7 said that he had copied the entire message from 7ZO, and had given it to the C.B.&Q. operator at Omaha who had sent it to Scott's Bluff, Nebraska. Evidently the Omaha operator was not in the same class as the Kansas City dumbbell. In the meantime 7ZO had been camping sleeplessly at the set hoping for an answer, but at 5:00 A.M. nothing had developed. However, the next afternoon at 4:50 P.M. (the afternoon of the 6th) the reply did come from Scott's Bluff. Casper was again in touch with Denver! The missing trains had been located!

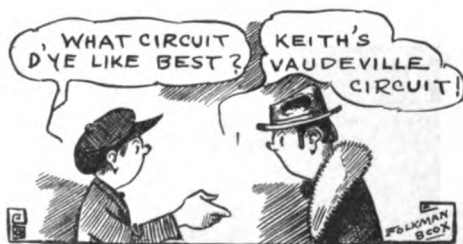
The evening of November 6th again saw the wires still entirely out of commission and with no indication when they would come in. Again the air was full of signals. This time the luck was better. At 6:30 P.M., 9DTM, W. L. Fick of Denver, answered with his 100-watt C.W. set and said that he was ready to help. Several messages were now put thru and a schedule of calls on the even quarter hours arranged. 9DTM now had to leave suddenly and was unable to notify 7ZO. However, he hurriedly telephoned 9AMB, Donald and Lewis Hathaway, of 1575 Pennsylvania Street, Denver and asked them to take the schedule. 9AMB was entirely without a set in operative condition. At 9:30 7ZO began to call 9DTM again but of course got no answer. The Hathaways went frantically to work and in less than an hour had their set operating. They say that the table was so full of loose wires that it was almost impossible to reach the key but they called 7ZO and *got him*. A seventy-two word message immediately came thru from Casper and was replied to by Mr. W. P. Wilson, chief dispatcher at the C.&S. at Denver. Wilson stated that a rotary snow plow was leaving Cheyenne so as to get thru to No. 29. Thereafter the two isolated dispatchers stayed in touch thru 7ZO and 9AMB. At 8:30 more messages were put

thru. Intermittent contact was then maintained until about 10:30 on the night of the 6th, when having putting thru over 300 words of vital railroad work, 7ZO and 9AMB thought that at last their work was over. They were slightly ahead of the facts, however. A.R.R.L. had more work to do in this emergency.

Shortly after midnight at 12:30 A.M., J. S. Carpenter of 9ZAF at Denver, roused out a newspaper editor and took from him the story of the souther end of the storm. As he took it he sent the installments to 7ZO. Over 500 words of this matter were transmitted and used in the "Casper Sunday Morning Tribune." This material was not all obtained at the same time and the last of it got into Casper at 3:30 A.M. From Friday night until that time Hood had gone entirely without sleep.

Chief dispatcher Wilson at Denver states that the amateur radio service in this case

was invaluable. Not only did it locate the two trains with fifteen carloads of people but it also prevented the loading of over forty carloads of stock at Wendover, Wyoming, which would otherwise certainly have gone out into the storm and been caught by it. The fate of cattle crowd-



ed into open cars during such weather is not a pleasant one to contemplate. Dispatcher Wilson is recommending that the C.&S. install radio telegraph stations of their own.

In the meantime the Union Pacific Railroad too had been struck by the storm. Their wires to had gone down and their traffic too had been handled by radio, and by amateur radio at that. Messages signed by the General Manager of the U. P. had gone thru 9ANQ. Unfortunately, thru excessive modesty of Wells of 9ANQ and Jolliff of 9AUS, we haven't the story of the Union Pacific tieup. Maybe we can pry them loose from it later.

But whether we even hear the complete story or not, the fact remains that amateur radio has again proven its value.

It is the same story as ever, fellows; when the stress comes it is the amateur radio man that is ready for the emergency; the A.R.R.L. man is the one who loses sleep, pay, and food, that he may help those who are in difficulties. It is he who thru heart-breaking delays, interference, static and fading, sticks to the job and does his unrewarded best. He asks for no publicity and the story has to be taken away from force before we can tell our own members about it. The part that

Wells and Jolliff at Kansas City played, is even now a bit hazy. But we are just as proud of them as if we knew every detail, and we certainly take off our hats to

9th and 7th district. And while we have them off let's make a bow to the sleepless wonder of 7ZO, Norman R. Hood.

—S.K.

A Tuned Radio-Frequency Amplifier

By Wm. F. Diehl *

THE amplifier described in this article is the result of a lengthy consideration of the problem of radio frequency amplification. R.F.A. is not new—many types of such amplifiers were used during the war. However, these were mainly designed for reception on a definite wave length or over very narrow frequency bands, the lowest wave length being 300 meters. Furthermore the vacuum

core for broadening the wave length band. This method, while very satisfactory as far as a fair degree of amplification was concerned, had the disadvantage of amplifying over but a very narrow wave length band. Transformer coupling was next considered, but here again while the amplification at the desired wave length was exceedingly high, yet even when using fine wire and iron-dust the wave length band was very narrow.

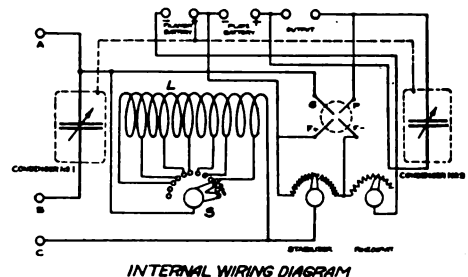
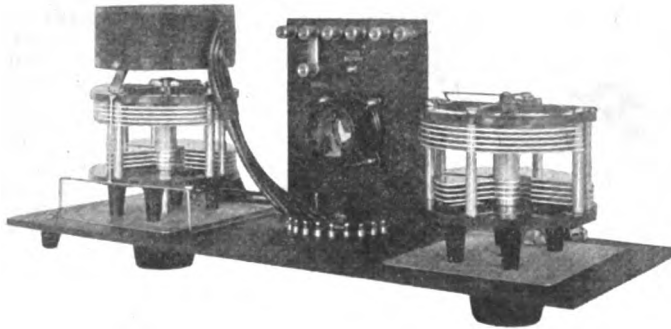
With these facts in mind attention was directed towards the development of an amplifier which would function over a range which would include the most useful wave lengths. The instrument shown herein is the result. It gives equal amplification over its entire wave-length range of 150 to 3000 meters. It is an amplifier of what might be termed the "tuned coupled-circuit" type. It has a tuned grid

circuit using a variable condenser and inductance, with the inductance switch so arranged that either a loop or antenna may be used. The plate circuit is tuned by means of another variable condenser and an output inductance which may be either (a) the primary

tubes used on these wave lengths were especially designed so as to have low capacity between elements.

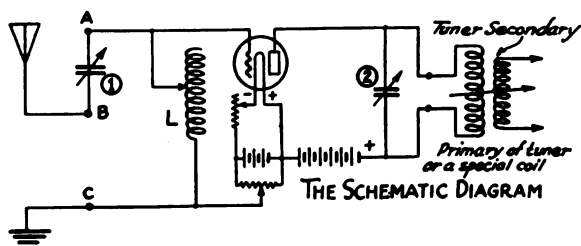
During the past year several manufacturers have attempted to solve the R.F.A. problem by designing transformers or choke coils of such characteristics that resonance is obtained at the desired wave length and using iron cores and resistance-windings to broaden the band of response. Tests were made in our laboratory using numerous types of circuits and employing various types of coupling elements. It was clearly demonstrated that the resistance type was out of the question for reception below 1600 meters, the reason being that at the higher frequencies the plate current, instead of flowing thru the coupling resistance elements, takes its path thru the capacity circuit afforded by the tube elements, so that practically no voltage is applied to the grid of the succeeding tube. The impedance type of coupling was next considered, using either an air-core choke with fine wire winding or with an iron-dust

*Chief Engineer, A. H. Grebe & Co.



of the variocoupler of the usual loose-coupled tuner or (b) a special inductance coil supplied with the amplifier which may be placed in any location where it is in in-

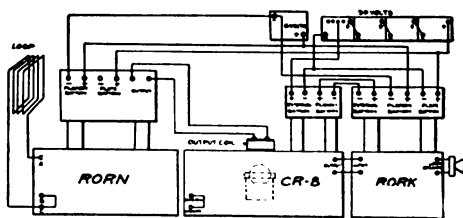
ductive relation to the secondary circuit of the usual tuner, of whatever type. The first method, of using the primary of the



two-circuit variocoupler as the output inductance, may be used on any standard tuner in which this primary circuit is not grounded to filament, but in Grebe three-circuit tuners the primary is grounded and therefore this connection cannot be used. Accordingly a set of four output inductance coils is provided, having wave length ranges, respectively, 150 to 400 meters, 250 to 800 meters, 725 to 1600 meters, and 1500 to 3000 meters. By this method it is possible to make use of any type of tuner for the tuned circuit feeding into the detector.

The amplifier unit contains a tube socket.

filament rheostat, and stabilizer for adjusting the grid potential, and is shielded in the usual manner. Binding posts are provided whereby either an aerial or a loop may be used. A square loop 3 ft. on a side, with turns $\frac{1}{2}$ inch apart, gave a wave length range, with the variable condenser provided in this set, of from 160 to 375 meters when 4 turns were used, and a range of from 220 to 600 meters when 9 turns were employed. Our tests have shown this amplifier comparatively simple to operate; using a solenoid loop of 12 turns on a 2 ft. square, C.W. and spark stations up to 1000 miles distance were copied during two nights of listening.



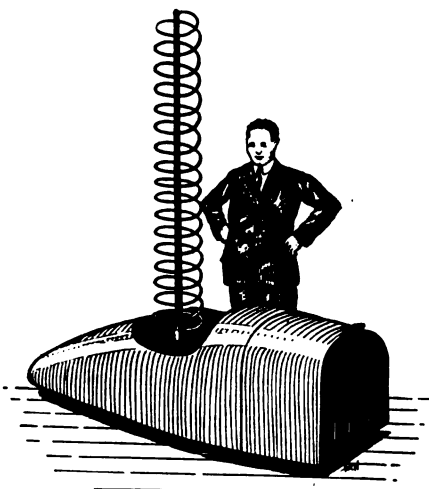
How the Amplifier is Used

The “Radio Hound”

DURING the preparations for the Seattle Radio Show this past summer the DX gang decided they would like to have a radio-controlled car as a novelty attraction. Such a device has been exhibited at numerous eastern shows and has attracted wide attention. Altho supposed to be extremely complex and involving secrets of design and complex mechanical and electrical apparatus, the Seattle lads pitched in to work and in three weeks' time one of their number, Kenneth G. Field, the fifteen-year-old operator of 7QB, had designed and built a successful radio-controlled vehicle, which was dubbed "The Radio Hound." It was enormously popular at the show, and its construction reflects much credit on its builder.

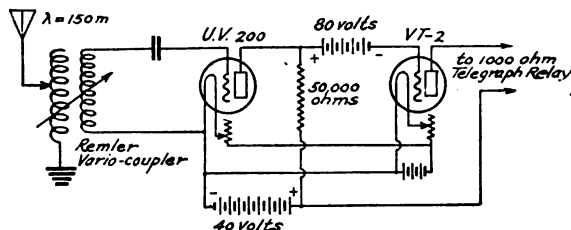
The idea is so simple that many of our readers may be interested, so we present a hook-up of the radio portion of the device and will briefly explain its operation. A small car, mounted on rubber-tired wheels and bearing a light racing-auto body, is arranged to be driven by an electric motor operated by a storage battery, and to be steered by the operation of another motor which actuates a drum upon which the steering cable is wound. In this particular

model the control was simplified to four actions: start, right turn, left turn, stop. Any one of these is chosen at will by an



electrical device known as a "selector," well known in railroad signal and auto-

matic telephone work. In principle it consists of a ratchet wheel bearing on its shaft an arm which makes contact with numerous switch-points; the ratchet wheel is advanced a tooth at a time by a pawl mounted on the armature of an electromagnet. Thus by sending a certain number of electric impulses thru the magnet, the ratchet wheel will be advanced the same number of teeth and its switch-arm will make contact with a certain stud. The selector used by 7QB actually had 24 contacts, so these were paralleled up, the 1st, 5th, 9th, 13th, 17th, and 21st being con-



nected together, and the others similarly, so that the series of 4 actions (start, right, left, stop) might recur all around the travel of the selector arm. The impulses to the selector magnet were supplied by a local battery upon the closing of a relay, the relay being actuated by the radio receiving apparatus, and to this we will now turn our attention.

The car bears a spiral aerial which, with the primary of a vario-coupler, gave to the open circuit a wave-length of about 150 meters, which was the wave-length of the secondary. The first tube con-

nected to this is the usual detector but the second tube presents an unusual arrangement, forming in conjunction with the first tube a balanced valve relay. The resistance and the "B" and "C" battery are adjusted so that normally no current flows in the output circuit of the second tube. When, however, a signal is received, the balance is destroyed, the potential on the grid of the second tube is no longer sufficient to cut off the current, and the plate current flows thru the coils of a 1000-ohm telegraph relay placed in that circuit. It is the local circuit of this relay which controls the selector. Thus whenever a dot is sent out from the transmitter, the relay trips and the selector moves one step; two dots, two steps, etc.

A small spark transmitter is used as the control, the operator merely sending out the proper number of dots to move the selector to the proper switch-point for the desired manoeuvre. Thus, the car being started, to steer it to the left the operator sends two dots, this moving the selector to the proper position before the steering motor would have time to act towards turning the car to the right.

Many other combinations, such as reversing, lighting lamps, ringing bells, etc., are possible—they merely have to be wired up to other selector contacts. It is decidedly advisable to leave a dead contact between every live one on the selector, so that immediately upon the completion of an act the control can be brought to neutral simply by sending another dot, leaving the apparatus all ready for the next control.

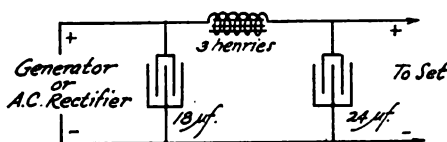
K.B.W.

Data Wanted on Filters

DO you own a filter that really works, OM? We're having a hard time locating really accurate data on the construction of a filter good enough for the job and still capable of being made at a reasonable cost. It's one of the biggest needs of amateur radio right now, and QST will esteem it a special favor if all persons owning what they consider a good filter will send us a description of it in order that we may determine therefrom what apparatus is serving well and present it in our columns for the benefit of the craft in general.

The theory of the Campbell filter was excellently outlined in the leading article in QST for October last, Figures 1 and 4 showing the low-pass type necessary in our problem of smoothing out a rectified supply. It is suggested that for a 60-cycle-rectified supply, the cut-off frequency might be

taken as 50, the capacities C put at 4 micro-farads, and L thereby computed. However, we understand some of the big companies working on this problem have had all their needs completely met in a simple filter arranged as in the diagram here shown.



What we need, of course, is a filter capable of taking our rectified A.C. and smoothing it out until it is substantially the same as battery voltage. Then there will be no "burr" on our C.W. sets, they will sharpen up immediately, the local "smother" which non-filtered rectified sets

make will disappear, and we will be able to operate our C.W. sets at any time of day or night without even local interference. Who's got the dope?

And, by the way, has anybody got results which approach what we need by the use of

self-rectifying sets with a tube "on each half of the cycle," satisfactorily smoothing out the 60-cycle modulation by means of a reactance in the common supply? If so, what are the particulars, please?

K.B.W.

Reminiscence

By The Old Boy

*Some for the glorious days of yore; and some
Sigh for the jazz-lade days to come;
Ah, take the tube and let the spark alone,
Nor heed the squeakings of a distant fone!*
—Rubaiyat of T.O.B.

SONNY, you talk many words of would-be wisdom concerning the marvelous advance of this radio game. You spout eloquently of stupid degeneration, feedbacks, periodically detuned aerial systems, decrements and increments. Your thorax bulges as you learnedly expound the principles of "the raddeo" to the novice on the next block. Ah, yes, it is quite a game, this radio, but sonny, I had some radio experiences of my own way back in '88!

This was back when I was the star reporter for *QST*, in the good old days when my pins were able to hold me up, and when coherers were good (especially since they hadn't any "concerts" to blame on the receivers).

One day Eddy calls me in and he says, sez he:—

"Old timer, I've a job for you. We've been looking up some of these DX records we've received for "Calls Heard," and I'd like to have you beat it over to this address and interview the op there."

"Yezzer," sez I, and off I hops to the address on the slip of paper he gives me. Springing up the stairs in the blithe manner becoming a young man of 67 summers, I rang the doorbell and was ushered in by the landlady.

"The radio room? Oh yes, right upstairs ten flights and knock on door number 71." After much loss of hot air I reached the door mentioned and knocked.

"Come in," cried a voice, and I twisted the door knob—

Bam ! ! ! — — —

When I came to I sat up in astonishment. Before me stood The Old Man, glaring at me with the most malignant expression imaginable. I seized my hat, muttered "My mistake," and scrambled toward the door.

"Come hither, my boy," he boomed. Involuntarily I turned.

"What dost thou here?" quizzed the

Patriarch, and I answered feebly, "Eddy sent me to get a write-up for next year's *QST*."

"*QST*?" shouted the O. M., and then burst into a smile which covered his features as a dollar covers the cost of a UV-2135.

"Whynell didn't you say so before? You from *QST* and me thinking you were another broadcast listener coming to tell me why I must QRX from 6 P.M. to 6 P.M. except Sundays during leap years when I can transmit from 7.00 to 7.01!"

Life seemed brighter and I adjusted my collar to meet my Adam's apple, which had risen three and a half feet in the excitement. After searching a while I found my composure and then pulled this one:

"Say, OM, I hear you made a distance record on your transmitter? Howabout-



it?" "Oh, that?; why, I worked a ham three miles away at ten o'clock E.S.T. which is 3 o'clock G.M.T., and gave him a whole message without killing the cat or biting my pipe in two."

"Wonderful! How did you do it?"

"Shh—I can't tell—it's a secret."

"Hexx! Well, anyway, OM, show us your junk, willya?"

Thereupon T.O.M. led me into a small room off to the left. At the threshold I paused in amazement. Goddlemitey, what a collection! The "receiver" was the first thing that caught my eye. A large screen door was hung up in the air with one corner submerged in a tank in which a gold fish was swimming about lazily. T.O.M. saw my look of incredulity and hastened to explain:

"You see, this screen door is very susceptible to osculations of great frequency and catches them like a net catches fish, and the oscillations shake the screen and cause a commotion in the water, whereupon the goldfish rises to the surface to see what the trouble is. Since the hams around here send at the tremendous speed of four point naught seven a year, the fish will rise for every dot and dash, staying longer for a dash, and so I can read the code very easily."

"Marvelous, OM, and what do you call this wonder?"

"This is the super-fishgenerator, and I prophesy that it will revolutionize the world."

"Let me get out before the revolution starts," sed I, but my wit evoked only a frown from T.O.M. So I turned to the transmitter. In one corner of the room was a cage and therein lay a black cat on a velvet cushion; on either side of the cage was a monstrous electrode, and the ends of these were connected to the hot water heater in the kitchen. I could see two leads from the heater where they went out through the window.

As I watched in mute astonishment, things began to happen and the goldfish started to show signs of excitement and then began to rise to the surface.

"A message—shh!" cried T.O.M., and seizing a piece of paper began to write dots and dashes to correspond to the fish's movements.

"Migosh, real DX at last, at last. Wait!"

With that he seized his key and then I did gape. First he turned to the cage and deliberately spat on the helpless cat. At this atrocious action the cat reared itself and yowled and the sparks started to fly from its fur. These were blown against the electrodes by a fan fastened to T.O.M.'s left foot, and then he began to pound the key. The oscillations immediately became so violent that the coil in the water heater started to shimmy and was on the point of flying off and banging T.O.M. on the head. Then he stopped and looked at the gold fish.

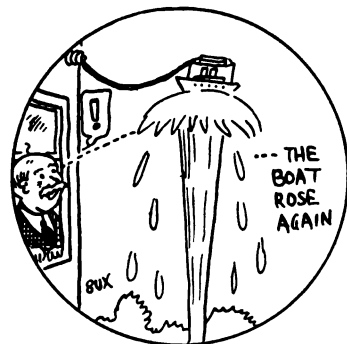
"Hexx" he cried, "He sez QRM from NAH!" Sadly he arose and turned to me. "Whynell do these darned amateurs always QRM us poor little novices anyway?"

"I dunno—but say, what do you connect the key to?"

"Well, you see, I'm using a system of incorrect control, developed by Prof. Turnsback, and lemme tellya it's the football's pigskin!"

With that he led me outside and pointed upward. From the center of the garden rose a high stream of water and in the top of it a small boat floated, held high in the air by the force of the stream. A small aerial was erected on this boat and a flexible braid led from the end of this down into the house.

"Watch," said T.O.M. and re-entered the house where I could see him at the key. He pressed it and the column of water



lessened in force, the boat dropping about ten feet. He released it and the boat rose again. When he came out he explained:

"You see, the key operates a relay which reduces the flow of water and thus lowers the aerial, changing the wave on which I transmit."

"Fer gosh's sakes—what next!"

"Nothing—you've seen it all."

"Where—well, say, OM, pse tell me how you worked that DX of yours, willya?"

"Well, all right, you see it was this way; I used the same city water mains that he did and when I pressed my key it made his bathtub faucet thump dots and dashes."

"Oh yes," I cried, enlightened, "quite a novel manner of transmi—"

"Lookout, the aerial's coming down!"

He cried and leaped for the door. I tried to follow but the breaking water column knocked me flat. Realizing that the falling boat would hit me, I grabbed blindly for The Old Man's hand, and was snatched thru the door just as it banged shut. Then I opened my eyes. A woman was bending over me, and I recognized her as the landlady who had admitted me.

"T.O.M.," I cried, "is he safe?"

She looked at me in blank amazement and then turned to a boy who stood beside her.

"Poor man, I guess he's delirious. Jack, don't you ever dare connect a spark coil to the door knob again! I don't care if you did think it was that boy next door! You heard me! Now march!"

And to me:

"I'm sorry but Jack will not be able to see you tonight. I'm sending him to bed

for that stunt. You wanted to see him about his set, didn't you?"

"No," I barked, and went out, slamming the door behind me.

So, sonny, you see everything isn't so new or wonderful in radio today as it seems. Whazzat? How have I lived so long? Well, son—I never listened to KYW.

Antenna Resistance Measurement

By Boyd Phelps, Assistant Editor

AN TENNA resistance is something that is probably more generally misunderstood by the amateur than any one other thing. We have read and heard many misleading discussions, and, although the author makes no claim for originality of the following, it is hoped that this may serve to straighten out many erroneous conceptions of radiation resistance and antenna current. Many amateurs are wont to brag on getting high antenna currents from their sets. To these this article is dedicated; especially the class that boast they are "radiating three amperes" when ten chances to one only a small part of the antenna current of three amperes goes to make up useful radiation.

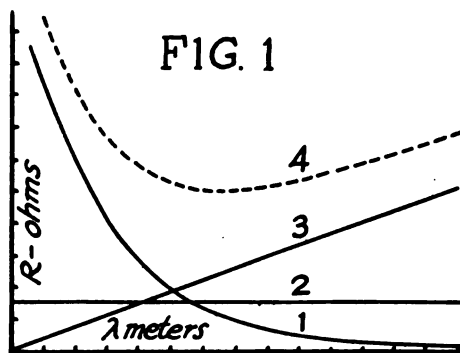
In order to understand what is to follow, it is necessary to have a clear conception of the factors that go to make up antenna resistance, and how these factors affect the range of a transmitting antenna, so a brief review of this will refresh our memory and form an understandable working basis.

Of the three components of total antenna resistance, radiation resistance is the only useful kind. The energy "lost" in the hypothetical radiation resistance is lost in a practical way. This energy actually produces the signal at the distant station. The greater the value of this resistance for a given antenna the greater the proportion of the antenna energy which will "get out" from the aerial. This resistance varies with the shape of the antenna, and with a given antenna it varies inversely as the square of the wave length, being therefore maximum at the fundamental wave length and decreasing rapidly when the antenna is loaded. Referring to Fig. 1 in which resistance in ohms is laid out on the vertical axis and wave length on the horizontal axis, starting with the fundamental wave length, curve 1 shows the variation of antenna resistance with wave length.

Ohmic resistance in an antenna is a heat loss and is not useful by any means. This includes the losses in the resistance of the antenna wires, ground, loading coil, etc.

The resultant of these resistances, combined under the term ohmic resistance, is practically a constant value for a wide range in wave length and is represented by the straight line 2 in Fig. 1.

The third resistance represents another useless power loss and is called dielectric absorption. It is the result of the antenna capacity acting as a poor condenser. The magnitude of this loss depends upon the nature and position of imperfect dielectrics in the field of the antenna, such as trees,



buildings, wooden masts, etc.* The loss of power due to dielectric absorption is represented by a resistance which is proportional to wave length, as the straight line 3 in Fig. 1.

From the above brief discussion it will be seen that radiation resistance is the only desirable resistance. Adding the curves 1, 2, and 3 produces curve 4 which is the total or antenna resistance. Unfortunately in actual measurement we can not segregate the components as in Fig. 1, and must

*No attempt is here made to take up the numerous factors that cause an increase or decrease in any of the above resistances; frankly, because there is not a wealth of information available. Mr. S. Kruse, now at QST headquarters, has been engaged for some time in collecting data on everything concerning amateur transmitting antennas and the "Antenna Symposium" is now nearing completion. Any of our readers who feel they have information they would like to contribute are invited to get in touch with Mr. Kruse.

content ourselves, for the present at least with measuring only the total resistance and estimating how this total is distributed among its three components. Failure of the minimum point to come down to a very few ohms would indicate high ohmic resistance, while a steep slant to the curve at waves higher than this minimum point would, in general, indicate high dielectric absorption. Regarding radiation resistance, a vertical cage would have very high radiation resistance near its fundamental, as compared with a low high-capacity antenna.

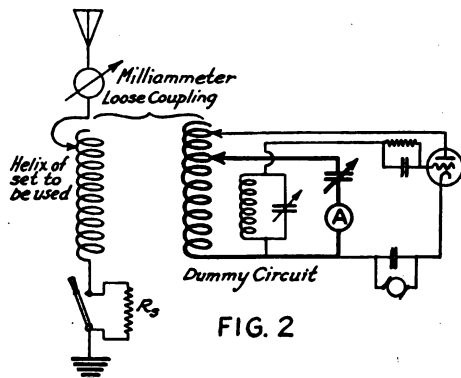
The idea that should everlastingly soak in is that the best operating point of an antenna is not the adjustment where the *antenna current* is the greatest, but the point at which the *radiation resistance* is the highest. As the number of watts put into an antenna is the product of the square of the antenna current and the resistance at that wave ($W = I^2 R$), it will be seen that raising the radiation resistance by working near the fundamental results in a *decrease* in antenna current for the same power input, but *more power* goes into useful radiation and a stronger signal is bound to result at the distant station. Ballantine* says that the loading coil inserted in the antenna lead for coupling to the power circuit should be as small as possible and its effect in raising the wave length above the fundamental compensated for by inserting a series condenser having low losses. The value of this condenser will lie somewhere between 0.003 and 0.0003 mfd. and should be built of mica or glass to stand 8,000 volts.

The efficiency of a transmitter cannot be measured without knowing the input and output. The input being easy to determine, it becomes necessary to know the antenna current and resistance to find the efficiency and know when the set is working at its best. The chap who is heard across the country on a 5-watt rates much more consideration than the fellow who does it with two 250-watt tubes. By keeping the efficiency high, higher voltages may be used and greater outputs obtained from small tubes without undue heating of the plates.

An antenna resistance curve may be drawn from measurements made with simple apparatus. The following instruments are needed: A C.W. oscillator, and accurate low-reading R.F. ammeter, and a non-inductive resistance whose value at radio frequencies is known. The resistance should have a value of about 10 ohms. It can be made of a piece of German Silver or other resistance wire, of some size smaller than No. 30 B&S, so that the direct current resistance may be assumed to be

equal to the r.f. resistance. For most work the d.c. resistance may be found closely enough from the wire tables, without measurement. As the length of resistance wire required will be quite small in any event, it is generally desirable to stretch it out in somewhere on the table away from the field of the transmitter, rather than to attempt a complicated method of non-inductive winding. The figure of 10 ohms is not essential, but merely convenient in calculation.

The regular C.W. transmitter of the station may be used for the oscillator or driver. However, this driver must be very loosely coupled to the antenna and it is essential (in order that the resistance curves mean anything) that the antenna circuit resistance be measured with the inductance coil of the regular transmitter in place in the antenna circuit. It is



therefore necessary to disconnect the tube equipment from the transmitter inductance, insert this inductance in the aerial circuit as shown in Fig. 2, and connect the tube equipment to a temporary dummy antenna made up of any convenient inductance and a shunt variable condenser, with the usual antenna current meter in series. The condition then reached is that the tube equipment is operating into a phantom antenna, and the inductance of this phantom is loosely coupled to the inductance normally belonging to the set, which has been disconnected and placed in the aerial circuit.

It is very important to have the two circuits very loosely coupled, as the changes in the resistance of the antenna circuit would otherwise be certain to affect the current in the dummy circuit. The antenna current meter previously mentioned as inserted in this dummy circuit should be watched to see that no appreciable changes in current take place while resistance measurements are made on any given wave length. However, it should not be expected that the dummy current will re-

(Concluded on page 41)

*"Radio Telephony for Amateurs," page 67. A description of this book appeared in a Book Review in August QST.

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Excelsior!

BY T.O.M. but this has been a month of accomplishment! Honestly, fellows, our head simply swims from the staggering blows the old A.R.R.L. bunch has been administering. We slipped out of the office for a few weeks to make a little trip around the country and by the time we got back so many things had happened that we haven't yet had time to get thoroly posted. Oh boy but it's the gnat's gnipples!

Here our noble Operating Department has gone over the top with a definite record on 50,000 free messages handled, more than ever before in our history. Hot canine! Heavens knows how many more msgs. we never got a line on. Attaboys; up and at 'em—make it a million!

And derved if kid Schnell didn't get busy with HPM and pull off a new speed record while we were away. Ten thousand miles in four minutes! We don't see how it could be any prettier unless they had waited until we could have got in on it too.

And these dinky little oceans that lie on either side of North America—they got their's last month too. The poor Pacific has been entirely annihilated, as graphically described elsewhere in our columns by signals reported from Japan and Australia; and the Atlantic—pooh! Nothing to it, fellers, when around a hundred calls get over to our British colleagues while we're merely tuning up for business and getting set for our Finals. Do you realize that it's just a step more and we will have to confine Calls Heard to reports from the Antipodes, diametrically opposite on this little old globe of ours?

One final accomplishment remains before us to add to the glory of 1922—reception by us of European amateur signals. At this writing no such signals have been reported but we face the rapidly approaching listening period with the calm consciousness that the A.R.R.L. will not fail.

Now trot out your greener pastures—we're hungry for more.

Presenting Mr. Babcock

THE old west-coast coal-burner of 6ZK, Mr. A. E. Bessey, has gone into the radio business and, as a result of the regulations in our A.R.R.L. constitution

prohibiting commercial radio connections for its directors, has been obliged to tender his resignation. We've hated to do it but there has been nothing to do but accept it, and Mr. Bessey retired from the Board of Direction at its last meeting, with the sincere appreciation of that body for the good work that he did for the League idea on the coast when he was an active amateur.

To succeed him for the remainder of his term of office the Board appointed Mr. A. H. Babcock, 6ZAF of Berkeley, Calif., well known in radio circles around San Francisco. Mr. Babcock is a man of mature years and judgment, a nationally known electrical engineer, and consulting electrical engineer for the Southern Pacific Lines. Amateur radio is his hobby and he has won his spurs in it. In assuming the West Coast leadership in A.R.R.L. thought, Mr. Babcock tackles a difficult proposition, for the League idea has been misunderstood there and altho there are thousands of A.R.R.L. members along the Coast they have not heretofore functioned as a homogeneous whole as amateurs have elsewhere. But Mr. Babcock is a splendid leader and we know he will have the confidence and support of all good amateurs.

There are a few Coast amateurs who in some unexplained fashion have come into the idea that the League is a dictatorial body "run" by a few higher-ups who dictate "thou shalt" and "thou shalt not" to the poor membership. It is strange how an idea so entirely contrary to the League spirit could have arisen, when the very principle of League organization is self-determination of all community matters. This A.R.R.L. that we amateurs have built is a *national* organization and the basic idea is that it provides a medium in which amateurs work together in all matters of common national interest, such as representation in radio legislation, the relay activities of the station net-work of our Operating Department, and such nationwide amateur problems as the need for co-operative action between the transmitting amateur and the novice listener, which latter problem is a particularly trying one on the Coast at the moment.

Amateur Radio in the Pacific states needs the A.R.R.L., and we are there to help. Give Mr. Babcock a hand, men, and we'll

have better conditions all along the line, with Amateur Radio setting firmly on its own right to exist.

"McWilliams vs. Bergman"

THE little town of Dwight, Illinois, is supplying the actors in a very interesting radio episode. In Dwight there lives G. Wiley Bergman, loyal member of our A.R.R.L., District Superintendent for Northern Illinois under the Central Division Manager, and operator of spark station 9CA. A few blocks away is a novice listener, a banker named Edward McWilliams. A few weeks ago the papers of the country blazed forth the fact that the first radio lawsuit between users of the ether was about to come to pass, for Mr. McWilliams had started legal action to restrain 9CA from transmitting and busting up his concerts.

It is a beautiful case from the amateur viewpoint. Bergman of course has a licensed station and his wave has been checked by the inspector and OK'd. It is true he has a spark, but sparks are legal and he cannot afford just yet to change to C.W. However, knowing that he must cause some interference to some of the broadcast listeners in his home town, particularly those with single-circuit tuners, and being a good A.R.R.L. man, he applied the doctrine of co-operation that we have outlined in QST, voluntarily kept his transmitter silent in the early evening hours, as District Superintendent saw to it that every other station in his vicinity did the same thing, published an announcement in his home paper over his signature as Superintendent to the effect that local amateurs would preserve a voluntary QRX period until 10:30 P.M., and went to see Mr. McWilliams when he learned that the latter was complaining to the radio inspector about him. But did this satisfy Mr. McWilliams? It did not! Mr. McWilliams is a banker, a wealthy gentleman, probably used to having his own way about a great number of things, and in blissful ignorance of the useful work that amateurs do he seeks in effect to have 9CA's transmission branded as a "public nuisance," refuses co-operation and makes no bones about the fact that he objects to transmission after 10:30 as well as before, and asks the Court to restrain 9CA from transmitting at any time at which he is likely to want to listen. Can you beat it?

Even before the "Rochester Plan" was announced, quiet air had prevailed around Dwight all the early evening, but you understand that is not satisfactory—amateurs mustn't transmit at all. Bergman is only an eighteen-year-old lad, and even though he is planning to make radio his life work isn't it obvious that he must not be allowed

to use his station when a banker might want to listen? This makes us pretty wrathful. We know Bergman; he has a good spark station which he made himself; he's a fine, clean, studious lad, typical of all that is good in A.R.R.L. members; he has played the game more than squarely, gone out of his way to try to help, willingly QRX'd half the night. But Mr. McWilliams seeks to prevent him from using the ether at all, in order that he, McWilliams, may have the air all the time! It seems to us Mr. McWilliams has taken on a rather large contract. It is a rule in equity proceedings that he who seeks equity must first himself do equity. Has he done this? The trouble is that Mr. McWilliams is entirely ignorant of the truth of the matter concerning amateurs and their status.

But, fellows, it means something to belong to the A.R.R.L. The League is squarely behind Bergman in this matter, not particularly anxious to make a knock-down-drag-out affair of it with a disruption of the entire radio situation in these United States, but fully prepared to do so and see the thing thru to a show-down if that is Mr. McWilliams's desire.

"And right will rule the earth!"

The White Bill

WHILE we're talking about laws, there's the matter of this White Bill, HR-11964, now before the House Committee on Merchant Marine & Fisheries, and its companion bill laying in the Senate's Interstate Commerce Committee. This bill, it will be remembered, is based on the exhaustive study of the radio problem made by Secretary Hoover's Radio Telephony Conference of last spring, and is the project which would do away with rigid classifications of stations and specification of their technical requirements and in their stead substitute an administrative scheme which would delegate authority to the Department of Commerce to make and enforce the regulations and to change them as progress in the art demanded, with the advice of a Technical Commission.

The present radio law of 1912 is a wholly satisfactory thing from the amateur standpoint. It specifies amateurs as one of the classes of stations, defines their rights, and covers their needs as well as it ever did. It is lamentably defective from every other viewpoint but the amateurs', however, and it is a foregone conclusion that it will have to be changed soon. The broadcast situation is chaotic to say the least, and the features respecting commercial and military stations need patching badly, none of which can be done until a new law is substituted for the present one. The White Bill represents the best effort that has been brought forth

to change things. Of course it is not a perfect document; it contains some ambiguous language and a double negative or two, it lacks some safeguarding features very desirable from the amateur point of view, it would give to all "government" stations the privileges intended only for military stations entitled to them for national safety, and practically every civilian radio interest is concerned about the provision which would authorize the President, rather than the Secretary of Commerce, to assign the wave lengths of government stations, with consequent danger of demoralizing all the work that Commerce might do. These things, however, are matters of words, things that can be remedied in a few minutes time.

Now this radio situation needs some strong medicine right now. If we accept it as inevitable that the 1912 radio law is going to be changed speedily, there are two reasons why we amateurs should boost the passage of the White Bill if amended in the particulars mentioned. The first is simply that there probably never will be a bill proposed more fair to the amateur. The second reason is that it is to the interests of us amateurs to have the broadcast mess unscrambled, for if this service can be put on diversified wave lengths instead of confined to the regions around 360 and 400 meters, it will be impossible for all the concerts to be jammed at once and the lot of an amateur transmitter in a community thick with novice listeners will be a happier one. Our Board of Direction expended lots of thought on this question at their last meeting and came to the conclusion that, subject to the exceptions they have taken to the bill and which are being conveyed to Washington by our Legislative Committee, the League ought to back it and make use of its great power for good by helping to create better radio conditions in our country.

And so, with the modifications which our representatives are putting before the authorities at Washington, we're for the bill, and for the betterment of radio in general we want to lend our weight to the general plan suggested by Mr. White. Members are urged to use what influence they may have with their Senators and Congressman to secure the passage of the bill when modified as outlined.

ANTENNA RESISTANCE MEASUREMENT

(Concluded from page 38)

main constant when the wave length is changed—the important point is that the coupling to the antenna circuit should not be close enough to let the dummy current change when the aerial resistance is varied on any given wave length adjustment.

The known resistance is inserted in the

ground lead and arranged to be shorted by a switch. For each wave length the driver is tuned to secure maximum current in the antenna but the coupling to the antenna and the power supplied to the driver must not be changed during the entire series of measurements. The coupling should be set at such a value that an antenna current of not over 50 milliamperes is produced when the resistance switch is closed. A hot-wire or thermocouple milliammeter with a scale of about 100 mils will accordingly be required in the antenna circuit. When resonance is secured and time allowed for the reading of the milliammeter to come to full value, this reading is noted and recorded as I_1 . The resistance-shorting switch is then opened and the reading of the milliammeter again noted and recorded as I_2 . The antenna resistance, R_a , at this particular wave length, is then given by the formula.

$$R_a = \frac{I_1 \times R_s}{I_1 - I_2}$$

where R_s is the value of the known resistance in ohms.

Readings should be taken 10 meters apart, from the fundamental to about three times this wave. It is best to make several sets of readings for checking purposes, as it is easy to make errors. A curve can then be plotted as curve 4 in Fig. 1. Humps in the curve indicate the presence of circuits in the neighborhood (such as guys, metal building frames, lighting wires, other antennas, etc.) that are in resonance at the wave length where the hump occurs. If the low point of the curve is excessively high, it probably denotes a high-resistance ground connection. Finally, if the curve to the right of the low point slopes upward very sharply, it denotes excessive dielectric absorption, probably due to the proximity of trees and houses, etc., and the antenna should be moved further away from these objects if possible.

With a resistance curve of the antenna one can tell not only how many watts are being put into the antenna but also just how good a radiator the antenna is, especially on the wave on which it is desired to operate.

BUREAU OF STANDARDS CALLS RADIO STANDARDIZATION MEETING

(Concluded from page 10)

paratus or service should be included, and (3) What procedure shall be recommended for carrying out the conclusions reached by the conference? If the conference decides that radio standards should be formulated, it is expected that they will ultimately be adopted by the American Engineering Standards Committee as an American standard.

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



50,929 messages! That is our big talking point for this month. That figure represents the combined effort of every A.R.R.L. Official Relay Station to reach the figure we knew was possible, and which we foresaw several months ago when our organization assumed such proportions, that nothing could stop our rush to this big unheard of record breaking figure.

* H. A. Beale, Jr., (3ZO) *
* Parkesburg, Pa. *
* Atlantic Division *
* 928 messages. *

Many long-standing records have been pushed far into the background this month.

Message Traffic Report By Divisions N O V E M B E R

Division	Stns.	C.W. Msgs.	M.P.S.	Stns.	SPARK Msgs.	M.P.S.	Stns.	TOTAL Msgs.	M.P.S.
Atlantic	95	7101	75	40	2230	56	135	9331	69
Central	111	7899	71	44	2248	51	155	10147	65
Dakota	29	2027	70	13	222	17	42	2249	53
Delta	16	705	44	3	248	83	19	953	50
East Gulf	30	1970	66	9	653	72	39	2623	60
Hawaiian	2	133	67	—	—	—	2	133	67
Midwest	69	5034	73	21	1481	70	90	6515	72
New England	49	4998	102	16	886	55	65	5884	91
Northwestern	26	1400	54	12	282	24	38	1682	44
Ontario	23	694	30	4	147	37	27	841	31
Pacific	38	1585	42	24	705	29	62	2290	37
Roanoke	45	2829	63	4	399	100	49	3228	66
Rocky Mountain	17	1633	96	1	27	27	18	1660	92
Vancouver	3	32	11	1	36	36	4	68	17
West Gulf	37	2708	73	20	388	19	57	3096	54
Winnipeg	3	225	75	1	4	4	4	229	57
Total,	593	40973	69	213	9956	47	806	50929	63
C.W. Messages, 40,973—88%									
Spark Messages, 9,956—12%									
Total,	50,929								

Every American and Canadian amateur of this Operating Department has done his bit to put our message traffic over the top by reporting his work. Men, this shows what can be done when we set out to do a thing.

After everything is boiled down, our entire success is due to the well-worn expression "co-operation." Without it we may well have an organization of several thousand men who would not produce the same results that are obtained with about eight hundred men and splendid co-operation.

Up to this time, January of 1922 was our best traffic month, when we handled 29,964 messages. In the same month 5ZAB handled 664 messages which has stood until now, when 3ZO with 928 messages, and 1AW with 743 messages knocked that record into a cocked hat. To 3ZO we tip our lid! The operator who signs "J" was on the air every night moving messages in big chunks and he has carved his sine at the top of the honor roll where it shall remain until some other good amateur surpasses this excellent exhibition of operating.

Were we to have a batting record as is kept in the baseball leagues, we would have some hitters if they could hit as high in the percentage columns as they do in handling messages. Ty Cobb, Babe Ruth, George Sisler, and Rogers Hornsby would have to go some to reach a few records which follow:

300 Hitters or Better in the Brass Pounders League

Call	Mgs.	Call	Mgs.
3ZO	928	9AOG	376
1AW	743	8VY	374
*2OM	562	1XM	367
9ZAF	536	2AJE	366
*1CNI	432	*8BDA	361
1CMK	425	8AIM	338
1BKQ	406	5XAD	329
9AWM	506	5TC	318
9OX	403	5IX	314
9AON	400	9BED	312
8QK	388	9BMN	308
		9DQU	308

(*) indicates spark stations.

Tremendous strides in traffic handling are shown in the Midwest, New England, and Ontario Division. Indications are that these divisions are not yet satisfied with their traffic totals and threaten to show increases next month. If that be true in these particular divisions, the others certainly will not stand idle long enough to be out-distanced in traffic handling, but until we catch our breath we hesitate to predict what the coming months have in store for us.

TRAFFIC REPORTS FROM A.R.R.L. OFFICIAL RELAY STATIONS

ATLANTIC DIVISION—C.W.: 2BBB, 95; 2AJA, 85; 2AJF, 180; 2ANZ, 5; 2BZ, 20; 2BOI, 27; 2AOS, 47; 2UE, 50; 2BWW, 5; 2BYD, 24; 2ALY, 156; 2AHO, 25; 2AFA, 31; 2CQZ, 116; 3JL, 29; 3CG, 74; 2BNZ, 15; 2CQZ, 117; 2AFP, 54; 2CKL, 48; 2TT, 5; 2ADV, 10; 2AUY, 37; 2BNL, 31; 2AQL, 7; 2CPO, 14; 2KP, 21; 2BRO, 7; 2AEO, 33; 2NZ, 215; 2TS, 61; 2BQU, 50; 2AGC, 10; 2IG, 20; 2CJJ, 1; 2AEQ, 57; 2OF, 48; 2AER, 10; 2BJP, 38; 2AYV, 26; 2CMG, 64; 2CGK, 6; 2FC, 70; 2ARS, 30; 2BUY, 16; 2AWL, 134; 2BMS, 122; 2AZZ, 2; 2AFA, 31; 2WR, 18; 2IG, 20; 2CGS, 41; 2BFE, 11; 2LE, 5; 2GR, 31; 8XM, 164; 2CEC, 8; 2CIM, 9; 2FZ, 4; 2BNC, 17; 2AVE, 76; 2AEH, 34; 2HW, 20; 2ANM, 8; 2AWP, 21; 2BQD, 33; 2CKN, 26; 2AJW, 9; 2AWS, 79; 2BRC, 78; 2BLP, 32; 8BEO, 14; 8CNB, 44; 8AGR, 21; 8RC, 2; 8ALF, 25; 8CL, 73; 8ZE, 15; 8ZD, 76; 8BLT, 11; 8QC, 9; 8AIO, 22; 8OW, 17; 8AGO, 76; 8CFB, 5; 8CKM, 145; 8BJV, 56; 8BJX, 64; 8CEJ, 32; 8XE, 164; 8CON, 3; 8VH, 2; 8BLU, 25; 8ADQ, 25; 8ADP, 9; 3YO, 90; 8BNU, 218; 8AAY, 143; 8GK, 4; 8BJY, 11; 3FS, 35; 8SM, 210; 8HX, 8; 8ZO, 928; 8KD, 17; 8MB, 68; 8LP, 26; 8BIT, 274; 8AAO, 33; 8CCU, 70; 8ANJ, 71; 8OE, 156; 8QV, 82; 8RB, 102; 8VW, 18; 8AJA, 4; 8BHM, 145; 8JJ, 82; 8IL, 25; 8ZW, 24; 8PZ, 24; 8OD, 8; 8SU, 51; 8AJH, 26; 8AC, 44; 8APT, 31; 8AJD, 81; 8WF, 28; 8HG, 94; 8AVD, 62. Spark: 2EX,

6; 2BQZ, 31; 2AJA, 2; 2CJX, 89; 2OM, 562; 2SQ, 102; 2BOI, 6; 2KK, 47; 8CS, 9; 2AXH, 25; 2AER, 6; 2QC, 12; 2AWZ, 12; 2CDR, 142; 2AAF, 91; 3FP, 78; 2AJE, 366; 2AEO, 23; 2DI, 34; 2CEV, 69; 2ND, 8; 2CT, 56; 2IF, 18; 2PY, 30; 2BY, 67; 8VW, 48; 2ZS, 7; 8QN, 88; 8UD, 55; 3GT, 54; 3GM, 8; 3TA, 4; 8HY, 4; 8EV, 8; 8ZD, 55; 8CEJ, 30; 8AGY, 5; 8VH, 15; 8ARO, 14; 8UC, 8.

CENTRAL DIVISION—C.W.: 9ZN, 252; 9OX, 403; 8QK, 388; 8VY, 374; 9DQU, 308; 8AIM, 338; 8FT, 287; 9APA, 268; 9IL, 248; 8IJ, 203; 9BRK, 190; 9CA, 187; 8ZY, 174; 9LQ, 163; 8CGX, 158; 9DDY, 144; 9CBA, 142; 9EL, 142; 8CAZ, 135; 8ZZ, 134; 8ZAG, 127; 8IB, 125; 9UU, 121; 9DCR, 120; 8BXH, 110; 8ANB, 103; 9BHD, 90; 8BNH, 86; 8CMI, 87; 8BCY, 80; 8BIZ, 75; 8BVR, 67; 8ALC, 75; 9AJH, 75; 9DBV, 63; 8AZD, 61; 8BTL, 61; 8CF, 63; 9ALW, 60; 9AFK, 16; 9BJT, 57; 9DYN, 56; 8BWK, 56; 8CFX, 58; 8ZF, 49; 8ZAF, 50; 9PQ, 50; 9CP, 50; 9BCT, 45; 8RKN, 45; 9AAP, 37; 9BLU, 3; 9DJO, 8; 8ACO, 2; 8CZZ, 1; 9BDA, 1; 8CGM, 43; 8BCL, 41; 8BHO, 41; 9ASE, 40; 8AER, 40; 8CAK, 39; 8BUC, 37; 9ALR, 6; 9YB, 36; 8WV, 35; 9AMQ, 82; 9DVM, 29; 8BEK, 27; 9ACE, 26; 8TK, 30; 8AND, 26; 8CBX, 26; 8TK, 23; 9BRO, 23; 9BDZ, 24; 9AHQ, 22; 8CWF, 22; 9CTE, 22; 9DGQ, 20; 9DCT, 20; 9VK, 17; 9DLR, 17; 8BZQ, 17; 8ATX, 17; 9EJ, 16; 8BYT, 16; 9BIL, 15; 9BYX, 15; 8CWC, 15; 8TT, 14; 8CXX, 14; 8BFB, 18; 8AZF, 14; 8AN, 14; 9DFF, 12; 9CLZ, 11; 9AKD, 11; 8BWS, 10; 9DWM, 7; 9ALP, 7; 8AWX, 7; 8HW, 7; 9BCH, 6; 9BLC, 6; 9YJ, 6; 9NQ, 5; 9BXD, 5; 9BHX, 5; 8BEP, 5; 8BYF, 4. Spark: 8TJ, 266; 8BEP, 195; 8ZY, 191; 9AAW, 161; 8AWU, 122; 8AIZ, 115; 8UC, 112; 9WX, 103; 9DHZ, 86; 9AMK, 75; 8BAH, 63; 9CP, 59; 9ASK, 32; 8CKV, 58; 9AZF, 52; 9AFN, 43; 9DXE, 38; 8CVD, 38; 9AZA, 31; 9ASJ, 31; 9DEL, 14; 9DHG, 19; 9NC, 28; 9NQ, 18; 8CMI, 15; 9AMQ, 15; 8BEJ, 14; 9DAY, 12; 8BBU, 10; 9DLN, 9; 8BEK, 8; 9VV, 7; 9BLU, 6; 9AKU, 6; 8AZF, 37; 8FI, 4; 8BR, 4; 8MS, 2; 8ZF, 1; 8BYN, 92; 9CD, 10; 9BBL, 15; 9CIZ, 28; 9DXT, 2.

DELTA DIVISION—C.W.: 5ZAZ, 65; 5JB, 82; 5HB, 85; 5ER, 50; 5FV, 85; 5AAB, 5; 5EK, 70; 5NV, 61; 5MO, 11; 5DO, 58; 5WO, 16; 5RE, 18; 5KK, 75; 5HL, 23; 5MB, 20; 5DA, 33. Spark: 5XAC, 164; 5JF, 78; 5BW, 6.

EAST GULF DIVISION—C.W.: 4LA, 15; 4FQ, 25; 4JK, 32; 4EG, 66; 4FB, 145; 4AS, 25; 4BB, 5; 4BK, 10; 4HW, 30; 4YA, 125; 4EH, 56; 4CG, 191; 4EL, 137; 4BY, 78; 4GE, 34; 4EB, 443; 4XK, 50; 4JY, 42; 4NU, 35; 4HZ, 26; 4IZ, 21; 4JZ, 77; 4OB, 7; 4KO, 4; 5XAE, 54; 5XA, 159; 5ZAS, 56; 5BQ, 44; 5ES, 18; 4CY, 45. Spark: 4FD, 65; 4GN, 62; 4MY, 72; 4HX, 30; 4BI, 55; 4MZ, 10; 5XA, 107; 5GT, 15; 4HS, 237.

HAWAIIAN DIVISION—C.W.: 6TQ, 47; 6ZAC, 86.

MIDWEST DIVISION—C.W.: AD7, 67; 9DSM, 41; 9CMK, 6; 9ATC, 24; 9BXT, 80; 9BWE, 18; 9CJJ, 63; 9DPF, 60; 9YU, 284; 9AFD, 75; 9AYS, 79; 9CIN, 5; 9CFI, 30; 9CCV, 115; 9BHN, 110; 9DTA, 112; 9AOG, 376; 9CKM, 94; 9DUN, 78; 9BZZ, 15; 9DSD, 119; 9ABV, 147; 9PS, 32; 9CWC, 9; 9DKY, 171; 9AHH, 120; 9ARZ, 117; 9AMI, 114; 9HRS, 108; 9DSL, 73; 9AOU, 68; 9FK, 62; 9BZI, 56; 9BGH, 50; 9BIK, 54; 9APG, 33; 9BCF, 27; 9CXP, 25; 9CHN, 11; 9BDR, 9; 9DJM, 6; 9BZE, 5; 9AXA, 5; 9BFG, 2; 9DYI, 2; 9DSL, 80; 9HK, 9; 9BLG, 119; 9CEE, 22; 9DXN, 48; 9NU, 5; 9CTR, 26; 9DFQ, 8; 9CGK, 20; 9BED, 312; 9BIE, 114; 9DZY, 42; 9FM, 100; 9AQR, 91; 9BJC, 2; 9BJB, 8; 9EX, 57; 9SJ, 70; 9ANO, 16; 9CTG, 9; 9BDS, 150; 9AON, 400; 9YM, 73. Spark: 9ALK, 19; 9DNC, 249; 9DRA, 30; 9BAL, 36; 9AFW, 48; 9BXZ, 9; 9ARG, 12; 9DMJ, 30; 9EAF, 9; 9DXV, 24; 9CUF, 6; 9DCW, 30; 9ACB, 9; 9RR, 96; 9AHZ, 54; 9AYL, 150; 9BKK, 21; 9BMN, 308; 9YM, 64; 9HO, 93; 9AOJ, 135.

NEW ENGLAND DIVISION—C.W.: 1YK, 49; 1AZD, 33; 1CBJ, 47; 1ADN, 55; 1LL, 30; 1BVH, 71; 1BNP, 27; 1AZW, 32; 1CPB, 43; 1AWO, 10; 1CSW, 3; 1ABC, 3; 1IL, 191; 1GV, 145; 1BQD, 56; 1ZE, 278; 1VK, 2; 1BDU, 22; 1CJD, 36; 1CPN, 83; 1BKQ, 406; 1BYN, 185; 1BEA, 48; 1AW, 743; 1CK, 24; 1XM, 367; 1CM, 3; 1KK, 72; 1COT, 35; 1CMK, 425; 1AWW, 15; 1BDI, 36; 1CDO, 94;

1ACO, 16; 1KX, 10; 1BNL, 55; 1BAS, 125; 1BRQ, 139; 1ARY, 23; 1AGH, 65; 1AYQ, 76; 1IV, 11; 1QO, 6; 1BOQ, 58; 1AJU, 76; 1AYU, 417; 1CR, 57; 1QP, 211; 1BHW, 44. Spark: 1BVH, 104; 1AHT, 9; 1CJN, 2; 1SD, 45; 1CK, 86; 1CM, 7; 1CNI, 432; 1RX, 25; 1LZ, 3; 1CIB, 30; 1BJS, 18; 1ACO, 24; 1APT, 24; 1FM, 76; 1BRQ, 3; 1ARY, 8.

NORTHWESTERN DIVISION—C.W.: 7OT, 182; 7BK, 181; 7BJ, 123; 7TQ, 119; 7WM, 102; 7MF, 92; 7TH, 67; 7JW, 57; 7BB, 55; 7DP, 52; 7ZU, 50; 7HM, 44; 7LR, 42; 7AEM, 36; 7QE, 31; 7TS, 31; 7OE, 28; 7JG, 20; 7EX, 20; 7UU, 16; 7QT, 14; 7OO, 12; 7FD, 11; 7JF, 9; 7AGF, 5; 7NG, 1. Spark: 7GE, 129; 7AW, 33; 7ZU, 25; 7BG, 21; 7EX, 15; 7TW, 14; 7MU, 13; 7AGI, 12; 7AFN, 8; 7AIC, 6; 7ZK, 4; 7NC, 2.

PACIFIC DIVISION—C.W.: 203; 6EC, 48; 6AVR, 19; 6AUB, 11; 6BJY, 71; 6AVX, 11; 6BBC, 6; 6XAS, 16; 6GD, 6; 6BPZ, 28; 6JD, 45; 6KA, 37; 6CU, 57; 6FT, 18; 6ALU, 20; 6BRD, 8; 6RR, 24; 6EB, 41; 6BJC, 7; 6BKO, 18; 6PL, 25; 6BUN, 22; 6BDW, 15; 6EN, 32; 6APW, 38; 6BKB, 20; 6ZN, 10; 6AOR, 78; 6TI, 44; 6ASJ, 54; 6ABX, 58; 6ZX, 85; 6AK, 94; 6GR, 60; 6GX, 22; 6FH, 106; 6CC, 103; 6TC, 25. Spark: 6AGK, 35; 6AVR, 26; 6AOW, 21; 6BJU, 6; 6OD, 40; 6ALD, 30; 6AMN, 22; 6BAE, 13; 6KE, 30; 6WI, 23; 6PL, 7; 6ADG, 6; 6AWM, 6; 6OL, 25; 6ABU, 20; 6ALV, 18; 6ABK, 6; 6EX, 78; 6AAU, 104; 6AOA, 106; 6HP, 15; 6ANM, 22; 6GR, 21; 6FH, 30.

ROCKY MOUNTAIN DIVISION—C.W.: 9ZAF, 536; 9DTM, 211; 9AMB, 172; 9XQA, 144; 9DTE, 85; 9BXQ, 54; 9BXA, 45; 9BUN, 35; 9BVO, 21; 9CCJ, 13; 7AFW, 33; 7ZV, 5; 7LU, 143; 7ZO, 61; 6ATQ, 50; 6ZM, 20; 6SJ, 5. Spark: 6BKE, 27.

VANCOUVER DIVISION—C.W.: 5CN, 7; 5CT, 14; 4DQ, 11. Spark: 5DX, 36.

WEST GULF DIVISION—C.W.: 5ZA, 273; 5IS, 48; 5GN, 4; 5ZH, 55; 5EL, 7; 5LB, 19; 5TC, 318; 5SP, 184; 5DI, 110; 5QI, 45; 5SK, 35; 5PK, 30; 5IX, 314; 5QS, 145; 5IR, 68; 5XB, 36; 5XV, 194; 5NK, 140; 5ZX, 7; 5BA, 10; 5FA, 10; 5XAD, 329; 5JM, 47; 5PO, 21; 5KP, 110; 5TM, 8; 5ZAD, 3; 5ZACA, 4; 5ZAR, 4; 5FT, 4; 5VM, 25; 5TT, 35; 5TO, 6; 5LB, 15; 5ZM, 24; 5ZG, 5; 5ZAV, 20. Spark: 5ACQ, 20; 5IS, 12; 5AL, 3; 5ZH, 22; 5TU, 127; 5QS, 37; 5IR, 44; 5UG, 10; 5RP, 10; 5FI, 5; 5QT, 2; 5XB, 6; 5YK, 18; 5ADI, 10; 5ZAE, 15; 5HC, 4; 5AEW, 6; 5AEY, 8; 5ADB, 4; 5AQ, 25.

WINNIPEG DIVISION—C.W.: 4BV, 148; 4HH, 70; 4BR, 7. Spark: 4CE, 4.

ONTARIO DIVISION—C.W.: 9BS, 39; 3XN, 2; 9BJ, 26; 3SX, 10; 3CO, 17; 3KP, 31; 3GK, 12; 3FC, 16; 3JK, 21; 3TA, 5; 3DE, 22; 3AW, 1; 3AL, 95; 3JH, 9; 3GE, 19; 3JT, 30; 9BS, 8; 3KO, 28; 3XN, 74; 3TB, 4; 3BV, 116; 3DH, 106; 3FA, 3. Spark: 3GN, 121; 9BS, 16; 3VW, 6; 3RV, 5.

ROANOKE DIVISION—C.W.: 4KC, 143; 4FT, 154; 4BX, 122; 4NT, 117; 4LJ, 122; 4GH, 86; 4EA, 64; 4DC, 37; 4GW, 14; 4DQ, 15; 4GX, 6; 4OI, 24; 4KT, 4; 4JE, 2; 3MK, 284; 3BLF, 258; 3ZZ, 186; 3APR, 140; 3IW, 105; 3CA, 101; 3BZ, 96; 3BVC, 65; 3AAG, 57; 3BHL, 52; 3BOF, 46; 3TJ, 36; 3AAU, 28; 3ASP, 27; 3BNE, 25; 3RF, 20; 3BMN, 15; 3ATZ, 12; 3AEV, 7; 3BIY, 5; 3AFW, 4; 3BFE, 1; 3SK, 1; 3SP, 37; 3AFD, 82; 3AUE, 74; 3BPU, 32; 3CHO, 21; 3AMD, 3; 3BKE, 38; 3CAY, 11. Spark: 3BDA, 361; 3IC, 9; 3ACK, 20; 3AOV, 9.

DAKOTA DIVISION—C.W.: 9AVZ, 91; 9YW, 68; 9PL, 54; 9BRI, 30; 9ASF, 11; 9GK, 74; 9BFQ, 3; 9GW, 3; 9EA, 2; 9AOR, 20; 9BAV, 12; 9BAF, 20; 9ABB, 8; 9BKP, 137; 9AWM, 506; 9AUA, 37; 9APW, 223; 9DGE, 20; 9AJP, 201; 9CCV, 15; 9AWS, 23; 9BJV, 51; 9AUL, 25; 9GD, 1; 9CRW, 5; 9DR, 128; 9BBF, 50; 9BKJ, 49; 9YAJ, 160. Spark: 9DKQ, 32; 9CGA, 19; 9FX, 19; 9AAU, 12; 9DLF, 2; 9XT, 24; 9FH, 6; 9EAU, 1; 9CZ, 15; 9DOT, 8; 9DGW, 34; 9DAG, 41; 9ATV, 15.

ALASKAN DIVISION R. A. Anderson, Mgr.

Nothing has been heard from any of the Alaskan members. Several amateurs in the

states have written regarding work in this division. From information contained in letters received from the amateurs in Prince Rupert, it appears that they will soon have at least one or two stations which should be capable of reaching Ketchikan, at least.

7IP, formerly of Craig, Alaskan Division, is now at Neah Harbor, Northwestern Division. In a letter received from him recently it appears that he is now doing just the kind of work that we would like to have seen done in the Alaskan Division.

KETCHIKAN: The school plans on constructing a receiver some time in the near future, and it is probable that by next winter this will branch into a five or ten watt C.W. set which surely should be capable of carrying telegraph over the eighty miles which separates Ketchikan and Rupert.

Thanks for your support and encouragement, DX men.

ATLANTIC DIVISION C. H. Stewart, Mgr.

We regretfully announce that Mr. Stewart suffered the loss of his mother, and then because of the illness of his wife, he has not been able to give much time to the Atlantic Division affairs in the past month.

State reports are missing from New York and New Jersey. However, information reaches us that Runyon, 2ZS, is back on the air, as is 2GR. We welcome them with open arms. The fact that state reports are missing should not cause any alarm as this entire section is running like clock-work on high.

WESTERN PENNSYLVANIA: About the only report received, was from district No. 9. 8ALF who is attending U. of P. operates week-ends. 8CEJ, who recently installed C.W., has been reported on the Pacific coast. 8OW is "MIM" in every district. 8AGO and 8BJV continue to reach out very well. The U. of P. station 8ZE is in operation from midnight to daylight every morning. 8SE is installing a 100 watt C.W. set. 8ZD also has been heard in every district.

EASTERN PENNSYLVANIA: Eastern Penna. piles up a big total of message traffic with the honors to 3ZO who handled 928 messages, thereby breaking all previous records for an individual station during one operating month. 3LP, 3MB, 3BJ, 3AHF, 3BIT, 3AAY, and 3BNU are stations which can be heard nightly; in addition to Philadelphia stations 3OE, 3FS, 3QV, 3ANJ, 3GK, 3KD, 3HX, 3SM, 3BJY, and 3UD. These stations are the ones that move traffic.

DISTRICT OF COLUMBIA: Traffic has taken a considerable jump and several new stations are in operation. 3SU, 3AJH,

3ARO, 3BHM, 3LR, 3ZW, and 3BSB are the leading traffic handlers in D. C.

MARYLAND: The majority of traffic in this state is handled by 3AC, 3APT, 3WF, 3AJD, 3AC, 3JJ, 3AFB, 3SF and 3UC.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

For the first time in many months a complete report of every state of the division is presented herewith.

All the assistant division managers are co-operating splendidly with the division manager and if they receive the same co-operation from the district superintendents, and they in turn from city managers and official relay stations, our division report will keep on becoming more complete.

KENTUCKY: Three consistent daylight routes have been established. 9EI, 9AOT, 9OX, and 9YC are doing most of the extreme distance work. More reports from the district superintendents of Kentucky will be welcomed.

WISCONSIN: Dist. 1: Nothing definite in the way of a report with the exception that things are beginning to open up in and around Milwaukee and that reports may be expected in the future. Dist. 2: Mr. Maas reports that it is impossible for him to locate in his district very many stations that are able to handle traffic to any extent. Stations in this district please take note and communicate with Mr. Maas. 9CHE will have a ten watt C.W. set on the air. 9CHK has a half K.W. spark but does not seem to get out. 9CPT has a ten watt C.W. set but is hampered by a power leak and cannot work after 6:00 P.M. Dist. 3: Traffic is improving daily. A great deal of help to the men of the established relay routes is given by new spark & C.W. stations. 9ZL is on the air again with I.C.W. 9AMQ is reaching out and is quite consistently on the job. Several old stations have taken new life and it looks as though the old Lake Shore route which runs up Lake Michigan is on the job again. The beautiful part of this route is that the stations have never forgotten the example set by ex 9ZL. Dist. 4: This district is being rounded into shape gradually. There are three good stations in La Crosse now, 9AZN with 15-watts C.W., 9AKY with 10-watts, and 9ZY, the station of the Wisconsin Manager, with two new transmitters just completed. One is 500-watt C.W. and the other a 15 watt. Dist. 5: Mr. Krusel has been making a trip in the surrounding territory for the purpose of finding some new relay stations in his district and reports some satisfactory results. Old 9YAC of Superior seems to be off the relay list at present. This is the Superior Normal School and since Mr. Krusel's departure the interest seems

to be lacking. 9PN is certainly on the job with three fifty watters is open for traffic every night, and has worked 27 states to date.

NORTHERN INDIANA: Dist. 1: A few of the stations now in operation are 9DAX, 9II, 9QR, 9DFB, 9PC, 9DEB, 9AJH, 9ME. Despite this number, the message total is rather small. Come on you Fort Wayne stations. 9AKD has been on the job only two nights. (Smatter AKD? —A.D.M.) Dist. 2: 9BLC, who is now in the hospital at Indianapolis, will be back on the job soon. 9CP has been heard in California about ten times in the past two months and has been reported QSA by 4OI. 9AIU is back on the job and has been heard in Nevada on fifteen watts. 9AWZ is again on the job. The Division Manager wishes to call attention to the unusual report received from 9II at Fort Wayne, Ind. A complete message report itemized by dates was forwarded by radio from 9II to the Division Manager at 9ZN, this message being relayed and delivered through 9AAV at Evanston, Ill. This is the first time that a complete report has ever been received by the Division Manager.

SOUTHERN INDIANA: J. E. Hall, Assistant Division Manager may be reached at 116 W. Tipton St., Seymore, Ind. His name and address are published herewith with the request that reports from stations in southern Indiana be sent to him in the future so that southern Indiana may be given real representation. Traffic in southern Indiana has been picking up greatly of late and excellent work has been done by 9BRK, 9LQ, 9BCT, 9DXE, 9ASJ, 9YJ and 9YB, also 9CBA. (But what 9LQ did to the text of my msg from 9AOG to Washington was awful. Sig "L.Q."—i. e. pre-war 9LQ). 9DCU is out of commission temporarily. (If I can get it by the Traffic Manager, this will include the complete Illinois report from N. C. Smith as the recent tremendous activity in Illinois (which has lifted it from the worst state in the Central Division to a runner-up as best) is solely due to the efforts of Smith and his District Superintendents. Please note the message total of 2030 for Illinois for November—D. M.)

ILLINOIS: Dist. 1: C. M. Schalkhauser reports that 9PQ with two 50 watt tubes is leading the roll this month. 9PQ is doing good work and has been reported FB by 6AFO and 6FY. 9AMK, spark, is still high man in Mendota. 9AHQ is the only other man to report. In Galesburg, 9NQ, the district superintendent, is trying out a new 100-watt C.W. Dist. 2: Rankin, 9BXD is doing fine work. The District Superintendent wants to know where that much touted sink gap is. Champaign; C. M. Weeks reports he handled

8 via C.W. 9DOG is on but gets no range out of his 5 watt tube. Champaign Urbana; Fine work is being done by all the stations, but 9DCR wins the cup. 9DHZ comes second on his rock crusher. 9DHZ has three operators and can be heard in the early hours of the morning. 9ASD has some QRM from school work and a nawsty storm brought down his antenna, so no messages. Dwight: The D. S. 9CA handled 187 messages on spark working as far as 1300 miles on 2 amps. in the antenna. Ole 9CCM, the wonder boy, on 5 watts is working every district but 6 and 7. He squeezes 2 amps. out of one 5 watt bottle and is getting every station he calls. (Congrats OM, more power to u—D. S.)

La Grange: 9AJH, is making preparations to put out real juice as he is increasing to 100 watts. Cabery: 9DDY the spark coil C.W. phenomenon is working 1000 miles with one bottle and a 4D spark coil. We will hear him next with dynamotor and 10 watts. Kempton: Martin Kempton of Kempton Bros. operator at 9DYN had to go to the hospital. Well he packed along a set to keep his hand in. He says "Gosh I couldn't have stood it except for the old set." 9DYN heard in 4OI (Porto Rico) Many congrats OM.—D.S.O. Danville: C. M. Fairhall reports he is having a hard time securing reports from stations under his jurisdiction. Roodhouse: 9MC is in the east on a pleasure trip. A good report was received from W. Fraley, assistant operator at 9MC. Quincy; No city manager, no report. Springfield: City Manager Schnepf failed to report this month. Dist. 4; Marshall: D. S. Nash reports that his station is now ready for business and he warns the rest of the districts to watch their laurels. O. M. Nash has every one on edge in his district and turns in 364 messages on his first report. He is a hard worker and when he promises he usually fulfills. (Let's hit the ball, D. S.'s. The more the merrier—A.D.M.) Decatur; 9DQU did not report to the A.D.M. Olney: 9DDZ at Olney, a newly appointed O.R.S. handled 24 C.W. Dist. 5: O. M. Hicks the D. S. hands in two cards form 9DLR and 9BDA. East St. Louis; No City Manager, no report. Dist. 6: Slogan, "Where we have real stations." 9BHD is still going strong with his 100 watts. He has DX report cards from the T.A.P. prelim tests that make one envious. One is from a ship 200 miles out of Los Angeles. 9BHD reports traffic moving nicely in Wisconsin via 9CHK and 9CWZ. Lena: 9CDB and 9CUO have installed 5 and 10 watts respectively, but no traffic was reported this month. Morrison: 9ALW reports going. He handled everything OK except west. 9FK and 9ATN are good but QRM is terrible. (A few more stations are needed up this way—D.S.) 9DHD reports his

burg DEAD. But here's one for the C.W. hams. 9DFX was reported almost every night in February 1922 in Berkeley, Calif. 9DFX uses a rock crusher. He is now erecting a T cage. 9DFX and 9DHD are up in the air with gap trouble, but are going to be on with the old TNT and perhaps a few bottles, no traffic. Freeport: As usual 9AKU is out with breakdowns. He worked 1100 miles on 1 amp. spark and handled 6 msga. 9AFN remodelled for fall and hands in a total of 43 via spark too. DeKalb; 9AMR has canned the spark and is on with a 10 watt whistle. 9AMR had a scrap with the B.C.L.'s who called him over to listen to amateurs. 9AMR listened and what did he hear? None else but NAJ working NUK! How can it wuz? Rockford: 9BQW going strong but no message report. 9DVW blew his bottle in the T. A. Prelim TESTS but is back on. 9DQR is putting in a whistle. 9DVW has been recommended as City Manager of Rockford. The recommendation has been forwarded for Matty to sign.

MICHIGAN: (Michigan bursts into the limelight with a total of 1500 which is the high water mark for this state. Keep up the good work—D.M.)

Please note that this is the heaviest month we have had despite the fact that we had ten nights of QRXing for the Preliminary Tests.

Detroit amateurs have voluntarily closed down their transmitters from 7:00 until 10:30 each night. Michigan Dist. is now in better shape than ever and things are rapidly developing to the point of being in the big League. 8AN was heard off the coast of California and worked New Orleans. 8CAZ worked 6XAD and 6KA on a five watter. 8ZZ was heard in Porto Rico and off the coast of California.

The Michigan A.R.R.L. Convention will be held in Flint in January. (Let's see the whole gang there—T.M.)

OHIO: All relaying is carried on by a few stations, which, however, are doing the job very well. 8QK on C.W. is heard clipping them off every morning and helps boost the League's traffic total. Apparently, the spark is on its last legs in this district. Only 8BEP and 8BVX retain the old rock crushers. Even at 8BEP a ten watt C.W. is stepping around the spark. The spark at 8BVX however, is doing very fine DX work now, being reported from as far as 7ZG QSA.

From Lima comes a letter from 8CCB, Mr. Van Gunten, which is very welcome, as Lima has been a dead town this season. There are now three C.W. sets in operation there, namely; 8CCB, 8ER and 8AA. Of these 8AA is doing the best work, working boiled-owled tricks and handling the traffic nicely. 8CCB, when he is on, is doing nice traffic work and 8ER will

be a good DX station as soon as the operator becomes a little more proficient. Mr. C. E. Nichols, Weadock Ave., Lima, has been given the City Manager appointment.

We want to chronicle an event which will cause the old spark hounds to lament. The old super-spark at 8ZY now reposes nicely under six feet of sod, while a little dynamite tube is setting the U.S. on fire. Fact, a single fifty watt tube, with an antenna current of 7 amperes is working the west coast every night. The nightly trick from eleven to six A.M. is worked by the two ops. The D.S. and the second op. Mr. W. K. Fischer of 8ANL of Cleveland, who signs WF. Dist. 3: Exceptionally warm weather and broadcasting has made quite an inroad upon the message work. The stations have not yet settled down to good consistent work. Through sickness, fixing up stations for the Trans-Atlantics, and putting up new stations, etc., the number of messages handled has fallen rather low this month. V. D. Getts, City Manager of Warren, having recently moved to his present location, found the city without a single radio station. He has erected his own station and is now doing relay work and has also lined up a couple of others who will put in C.W. sets. W. F. Warden, 8BWA, has been appointed Akron City Manager. Dist. 4: Under the able supervision of L. E. Furrow is going in fine shape. More stations are lined up for reports this month and all doing good work. The bulk of the traffic through Dayton seems to be handled by 8BFX. 8CGX and 8AJM, also 8BDO. 8UC and 8AIZ our old spark standbys are also doing excellent work. Dist. 5: This district has slowly been picking up. Superintendent M. F. McDowell has lined up some stations in Lancaster which are breaking into the relay game. They are 8AER, 8BHO and 8CWP. Messages for Newark must be routed via 8YM at Granville.

The Columbus stations are all doing good work. 8IB, 8BXH, 8BYN, and 8TJ all turning in excellent reports of messages handled. 8TJ is in the air again after moving his station to an open space south of Columbus, to get clear of interference. He erected two 80 foot masts and has housed his set in 14' x 18' building. Both spark and C.W. are used. Incidentally, the bulk of his 289 messages were handled by spark. 8IB and 8BXH are both working the sixth and seventh district stations direct. 8ARV is back in the air with the new call 8BYN. Dist. 6: This district is at present without a superintendent due to the resignation of R. D. McCommon. No one has as yet been appointed in his place. Stations in this district will please report direct to the A.D.M. until the appointment can be made. Only one report

received from this district, that of R. W. Sears, 8BKN. His aerial is undergoing changes which will put him in better shape for more work next month. 8CMI is doing good work both as Marion City Manager and in message work. Attendance at Ohio State University, prevents Mr. Whysall from operating 8CHI except during week ends. 8IJ also in district 2, managed to handle 203.

DAKOTA DIVISION N. H. Jensen, Mgr.

Many of the relay stations in this division are not sending their reports of traffic handled to the District Superintendents promptly, and some stations make no report at all. Fellows, if you want your division to receive credit for all traffic handled, you *must* send a report to your District Superintendents *promptly* at the close of business on the 15th of each month. All of the Superintendents in this Division are working hard to increase traffic in their respective districts, and the least that station operators can do is to send their reports promptly. Write to your district superintendent for traffic cards and information about relay work.

MINNESOTA: Dist. 1: Traffic is being moved with fair regularity throughout the district. A new station, 9EAU, owned by Mr. Bruce at Chisholm is now in operation and is a big help in filling the long jump between Duluth-Superior stations and north to 9ZC. In Duluth a very satisfactory arrangement has been made between the amateurs and the two broadcasting stations, WJAP and WMAT. Both stations have agreed to shut down at 10 P.M., 9CO has installed a 15 watt C.W. Set and Mr. Lampe, formerly 8OP reports that he is going to put in a 50 watt set this winter to help move traffic and put Duluth on the map. The Superior stations failed to send in a report, although it is known that traffic has been handled there. 9XT has a fine station and reports that they have a sure range of 600 miles. They will maintain a watch from 2:30 A.M. to 6 A.M. on Tuesday, Thursday and Saturday nights, and from 9 to 10 P.M. on other nights. Glad to get a report from 9XT. 9BAV, reports traffic moving in good shape. He will soon have an early morning schedule with 9AUA. 9FH has been handling some traffic lately. He is handicapped however, in getting enough power for DX work. 9EA has sold his old C.W. set and will soon be on with a new and more powerful outfit. 9ZC has not been on for a while on account of a delay in getting his license renewed.

NORTH DAKOTA: Relay work is picking up in this district. 9GK is doing very good work with 100 watts and is reaching out to both coast. Four operators stand

watches at this station as follows: Wick on Sunday; Lucas on Tuesday, Reinicke on Thursday; and Hance on Saturday. It seems to be almost impossible to work Montana stations this year. 9AEJ, City Manager of Fargo, reports that another 50 watt station will be going in Fargo very soon.

SOUTH DAKOTA: Traffic is going through in good shape, but it seems next to impossible to work any 7's. QRM from eastern stations is very bad. 9PI works all over the country with a 250 watt tube. 9BRI is increasing his traffic handled, and has been reported on three coasts. 9YW is doing good work and reports that a motor-generator will be installed. 9ASF is getting a lot of juice into his aerial with 15 watts and is reaching out in good shape. 9DKQ is doing very good with one of the few sparks left around here, as also is 9CGA of Huron with a $\frac{1}{4}$ K.W. 9AVZ lost his 75 foot mast during a bad wind storm and some message were on his hook. The aerial was fastened to the barn 30 feet high and the amps jumped to $4\frac{1}{2}$. After getting electrocuted a number of times, got the rectifier to percolate and raised the antenna current to $5\frac{1}{2}$ amps. DX was less with the low aerial, although reported on Pacific Coast four times. No report received from 9YAK, 9CXV, a new station at Yankton owned by Wm. W. Eymmer, is reaching out with 10 watts.

DELTA DIVISION **J. M. Clayton, Mgr.**

All sections of the division continue to show a steady increase in activity. A good deal of active relaying is being accomplished in spite of the Trans-Atlantic Tests, etc.

ARKANSAS: 5ZL is off the air. Some brilliant joker, late Halloween night, playfully released the top set of guys on his seventy foot pipe mast. 5JF, while not on a regular schedule, is handling a lot of traffic like a hardboiled oldtimer. He is reaching out in excellent style and doesn't clutter up the air with a lot of useless hash. 5WK, C.W. is heard once in a while, as is 5WE, also C.W. 5CB is having trouble of some description, as he has been heard only once this month. 5XAC continues to handle a good amount of traffic. 5ZAZ, D.S. of district "B" has nothing to report. 5JB has been offered the job of D.S. for district "D" but has not replied yet.

LOUISIANA: New Orleans continues to be well represented, by 5HB, 5ZAP, 5UK, 5AA, 5RH and a few others. The most phenomenal work is being done by 5HB who works 7SC of Seattle, Washington with apparent ease, and also stations in every district of the United States. The Pullens at Houma continue to maintain an unbroken silence. They may have a

surprise to spring on us, but they're going to be a disappointed couple when they read this and learn that information reached us to the effect that Brother Joe is about to launch his matrimonial bark. Who's the happy girl Joseph?

MISSISSIPPI: 5YE is experiencing a little difficulty in getting his C.W. transmitter tuned properly.

TENNESSEE: Many new stations have come to life with a corresponding addition to the total of messages handled. 5IK has installed 50 watts. 5MO has discarded his good old spark for 100 watts C.W. 5EK is going strong with 100 watts C.W. and reaches the West coast frequently. 5DO and 5NV are busy stations these days and are to be commended on the way they put the stuff across. 5BW has gone back to the spark and 5RZ also. Wassamatter fellows? 5FV has added another bottle and now has 100 watt. 5ER and 5FV are going out to the west coast every night and are not slow in handling traffic. 5AAB has gone to C.W. 5EG has installed 50 watts C.W. and being an excellent operator, will be able to handle considerable traffic. Welcome EG. The bunch has taken exception to the last report and is beginning to show activity. 5XK, 5RE and 5WO are all going fine and will be able to handle traffic during the cool weather. 5UU will have his new 100 watt set in operation very soon. 5RE has been appointed City Manager to succeed 5WO. 5WO has left the city to attend college. 5WS has a new generator and soon will be with the gang using 20 watts C.W. to refute the statements regarding the stillness of the ether around Knoxville. Plans are now under way to establish daylight routes through eastern Tennessee to connect with Nashville, Tennessee, Louisville, Ky., Atlanta, Ga., and Savannah. 5HL is going fine with 10 watts and 5MB, the City Manager, is going strong with 100 watts. 5AAG is a new station and has just been completed. 5CU has left for school in Washington, D. C. 5DA has been spending a few spare moments with the old set and handled a small amount of traffic. The old set is reaching out very well and stations in New England and the west coast are worked consistently.

EAST GULF DIVISION **B. W. Benning, Mgr.**

FLORIDA: It is very gratifying that the true Amateur spirit is gaining strength in Florida. Through the efforts of the A.R.R.L. members, many B.C.L.'s are being taught the proper spirit, and are becoming real boosters for AMATEUR RADIO.

Florida is again open to relay traffic, with relays at Jacksonville and points

south. The number of stations in operation, and the number of messages being handled, are steadily increasing. 4HZ is on regularly with his C.W. and is clearing traffic in all directions with ease. He is to be commended on his excellent work; although using but 5 watts, he works regularly over distances of 900 miles, and has worked 800 miles in daylight. Jacksonville is also represented by 4EZ, spark, just reopened. Central Florida is alive with good stations: 4JZ, 4JY, 4IZ, 4XK, and 4NU are all doing good work and handling messages on C.W. while 4DL, C.W., and 4BC, spark, complete the chain which is proving a speedy traffic route for the Peninsula. The Assistant Division Manager is pleased with the progress being made by his men, and is jubilant over the outlook for the future.

The following appointments have been made: R. C. Bender, 4DL, District Superintendent of District No. 4, vice 4DZ, resigned; Gifford Grange, 4HZ, City Manager of Jacksonville; and Thomas Litschauer, 4JI, City Manager of Orlando and Winterpark. These men are working diligently, and their efforts are getting results.

ALABAMA—Dist. 1: 5ZAS, 5BQ and 5CP are the leading traffic handling stations in this district.

Dist. 2: In addition to 5ES who is handling most of the traffic, 5ABT and 5NL do some little work.

Dist. 3: About the only station here is 5XAE who works rather consistently.

Dist. 4: 5XA, in addition to reaching out all over the United States, shows a decided increase in messages handled for the past month.

GEORGIA—4FD and 4AS continue to bat them out regularly. 4AK is on with 15 watts of C.W. 4BB also is doing some good DX work, as is 4BK who just came back on the job. 4DH has not completed his set as yet. 4GN has over-hauled and is reaching out from coast to coast.

SOUTH CAROLINA—The decreasing activity is due to the fact that many stations are being remodeled, while 4EG has kept the traffic moving. 4KI and 4JK are all set now, but 4FE has blown so many tubes it will take him months to recuperate from the financial shock. 4FQ and 4LA will be heard from now on with increased power. Traffic has opened up in all directions and 4EG has daylight schedules with 4EB, 4FJ, 4JK, 4LA and 4FQ. In the evening schedules are maintained with 8BDA and 4FS. About the only remaining spark stations are 4MY and 4BI. 4HX and 4HW moved some traffic but were not right up to their regular schedule.

HAWAIIAN DIVISION

C. J. Dow, Mgr.

6ZY, the new C.W. station of Radio Gunner, Thomas A. Marshall, of Honolulu, is just about ready for some excellent work to the mainland. A 250 watter is putting out about 10 amps, and should create quite a disturbance in the air. Mr. Marshall is an ardent A.R.R.L. member, and we hope our next traffic report will include a good number of his handling.

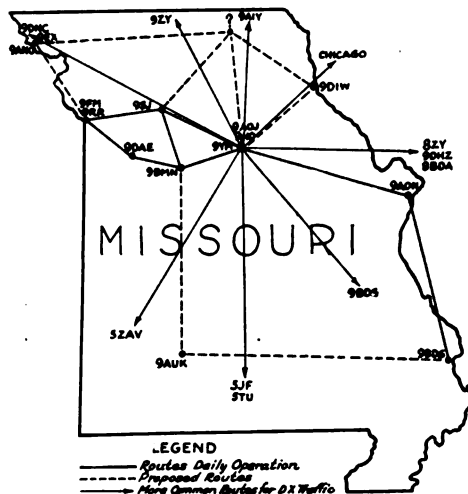
6ZAC still working with one 50 watter, and a recently constructed chemical rectifier, which has increased his efficiency a great deal. It will prove of comparative ease to maintain a schedule with 9AWM direct with the advent of a little better radio weather. 9AWM reports 6ZAC, QSA always.

MIDWEST DIVISION

G. S. Turner, Mgr.

MISSOURI: The "SHOW-ME" state, true to its name, is showing the other states the way.

O. S. McDaniels, 9YM and 9HO of Columbia, Mo., is route manager and has all official stations working overtime. McDaniels is reaching all points from his location in the center. He reports that cross state routes are in fine shape. He has 11 points connected up by good reliable routes and has Missouri ready to handle traffic at all hours of the day or night. He



is especially to be commended for the good daylight routes he has succeeded in lining up. 9YM works 9AON regularly at 11:30 A.M. 9HO works 9BNM and 9DNC in the early morning. 9BMN then works 9FM in Kansas City this completing the old reliable central Missouri route. Other routes outlined and made up with the co-operation of both district superintendents

are shown in the district superintendent's report below. 9DZY is always on the job and is certainly taking care of his neck of the woods. 9BED has even such cubs as 9BLG handling over 100 messages a month, not mentioning some of the other fellows who have dusted off their sets and are literally sitting on the key. 9CEE, 9BEI, 9DCW, 9DXN, 9NU, 9DMJ, 9CTE and others are swinging into line and working. Formerly 9PW and 9CGK were seldom heard. Now these same stations are working ones, twos and sixes.

The Western half of the state is ably taken care of by 9RR. Kansas City always known as a wide awake, thriving, business city, has been lagging in radio activity, especially League activity but since 9RR took hold of the reins, K.C. is rarin' to go. 9FM is the King C.W. operator of that city. 9ANO is having a time trying to adjust his differences with the light department. All others there are in the same fix. St. Joseph still uses arc lights, the original QRMer. In spite of this however, the boys are getting out in great style and relay traffic is improving. 9EX has been keeping the town in the radio field. He is on practically every night and does considerable daylight work. 9CTG is a newcomer in relay circles, although an old timer at the game. He is doing fine. Glad you're back again OM. The following operating schedule has been arranged: 9ANO in early A.M. 9EX at Noon, 9ANO and 9CTG in the P.M. and 9FA, 9DRW, 9ANO at night. 9AON is working consistently every hour in the 24. 9BDS is coming through in fine style as is 9DWK. 9ACB is on the job as often as his dad will stand for it. 9BMN is an ORS that between school and the broadcast listeners he is certainly doing fine. 9BMN is a real official relay station. 9AUK is perhaps not well known but surely will be soon. The old man is too busy with this A.R.R.L. stuff, the St. Louis Radio Assn. and lastly his profession to be on the job regularly and handle DX. 9LC was recently heard tuning up a C.W. and phone set. Let's hope Bill becomes serious and comes back to earth like he used to in the GOOD OLDEN DAYS. (Atta Boy, Bill, let's see her perc—T.M.)

Relay routes: Route A as follows: 9YM-9BMN - 9SJ - 9RR, - 9CKM - 9BSA - 9DTA-9AOG-9CFI-9CCS-9DUN and 9DXD. Route B as follows: 9YN - 9EX - 9BHN - 9CKM-9ANQ-9FM and 9RR. Route C as follows: 9DAE-9BMN-9AVK-9AYL.

The only new appointment made for the past month was that of Boyd Laizure of Kansas City as District Superintendent of Western Missouri in place of Abercrombie. All you fellows of Western Mo. please write Laizure at 1117 Askew, K.C. Mo. and get

lined up on relay routes, etc.

Again station 9AON wins honorable mention in the Missouri report having handled the largest number of messages in the Division. Great work OM.

The A.D.M. believes that the above shows a material improvement of conditions in Missouri. The members of the A.R.R.L. in this state are certainly entitled to thanks for their ardent work and tireless efforts in putting Missouri on the map.

KANSAS: Traffic has been going strong this month with nearly twice the number of messages handled as last month. Several new stations have gotten into action, i. e. 9BZZ and 9CWC. 9DTA opened up with a C.W. set after being off the air since last spring. 9AEY made his 50 watter oscillate by building a new counterpoise. 9BSA has blasted the air a few times but he says he will have C.W. installed soon. The first annual convention of the Kansas Radio Relay League was held November 16-17 at Hutchinson. Approximately 75 members were present from all parts of the state. The program included talks by S. Kruse, C. A. Stanley and Wilber Cooper, Jr.

Considerable trouble has been experienced lately in getting QSR west. The Denver stations seem to have all died off this month and are heard only at rare intervals of ten days or so. What is the matter with your fellows over there? If you guys want some juicy bunches of traffic,—just call most any Kansas station.

New appointments this month: 9DTA Clifford Peters, Tonganoxie, Kansas—Official relay station.

Again the A.D.M. handled the most messages in Kansas and again wins honorable mention. (Good work OM—D.M.)

NEBRASKA: Never before has such co-operation been extended on the part of the different district officers. The following men have made possible this report: Porter H. Quimby, Omaha City Mgr., Sgt. Stenback, Fort Omaha, Neb. AD7, and Edwin R. Anderson, Nebraska route manager.

The route manager wishes to call particular attention to the station of AD7. This is the station of the E & R School at Fort Omaha, Neb. This station is under the supervision of Sgt. Stenback whom many of us will remember as 5YH in the old spark days. AD7 is working both coasts consistently. We wish to take this opportunity to thank Sgt. Stenback publicly for his interest in the A.R.R.L. and his co-operation in handling our traffic.

The district superintendent of northern Nebraska says that the bulk of the traffic handled in his territory goes by way of the Omaha stations. 9DSM, 9CKM, 9ASO and 9ATC are handling the bulk of the traffic. 9AIN has been in the hospital. 9BZK has made a few changes and his sigs

are stepping out in great style now.

The Route Manager wishes that all transmitters of any size or description out in western Nebraska would get in touch with him if interested in handling traffic for the A.R.R.L. Address all communications to E. R. Anderson, Route Manager, Nebr. 308 North 27th Ave., Omaha, Nebr.

Omaha is adhering strictly to the Rochester Plan with much success. The City Manager of Omaha has obtained permission to broadcast bulletins concerning the League's activities from one of the stations. It furnishes an excellent means of disseminating amateur propaganda to the general public and the broadcast fans. F.B. old man.

9DNC and 9YU are commended on the amount of traffic handled. 9DNC wins honorable mention in the Nebraska report, for handling the largest amount of traffic.

IOWA: 9ARZ is especially commended for his excellent report.

9BIK and 9CXP are keeping Waterloo open for traffic east. 9CXP is a new man in this state. He was formerly an operator at 9ZT. Both stations are using 100 watts C.W. 9APG, 9BDR, 9BCF, 9AXA, and 9DAH are keeping Ft. Dodge open. 9AHH has opened up with C.W. 9AOU is using 50 watts. 9CHN nad 9BRS are doing good work. 9AFW is back with the gang again. 9AMI has increased his power to 100 watts and 9DKY to 50 watts. 9BXI is back stronger than ever with a new 50 watter. 9DJM also has 50 watts. 9BGH is going again. The best routes for daylight are as follows: 9BGH and 9AEQ can take traffic from Nebraska and can pass it on to 9AXU, 9DCF, 9AOU and 9AHH. These fellows work 9BZI, 9BIK or 9CXP who can QSR to 9FK or 9XAC. Another good route is 9BGH via 9ARZ. 9DKY or 9AMI to 9XAC, 9BIK or 9BHD. 9DSL is using ten watts and getting out in great style. 9MS has moved from Davenport. 9FK is doing some excellent work. 9HK is temporarily out of commission; likewise is 9DMH, who is installing a 200 watt set.

Traffic is moving very well throughout the state. The daylight routes as outlined, are working in fine style. Several of the operators have daylight jobs which throws the bulks of the daylight relaying on a few stations.

9AEQ is back on the job again and going strong. The following were appointed ORS: 9YA, 9ARZ, 9CS, 9BSG, 9BGH, 9AEQ and 9FK. 9ZAA surely rips in again.

9DKY handled the largest amount of traffic in Iowa.

NEW ENGLAND DIVISION

I. Vermilya, Mgr.

Good night! was there ever anything quite so thrilling as this before? Think

of it—a total of 5884 messages in the New England Division.

We must give our Headquarters station, 1AW, the blue ribbon this month. It is also noticeable that we find 1AW under the C.W. class. The second honors go to 1CNI.

MAINE: A good report comes from our friends up near the border, the C.W. boys having 475 to their credit, and the sparks 170.

NEW HAMPSHIRE: This state is now coming through in good form, and by next report we hope to have the honor of announcing a new and active Assistant Division Manager. At this writing, these arrangements are under way.

New Hampshire reports a quiet period between seven and ten P.M. 1CM handled 3 messages on his old stone crusher. 1IX, C.W., handled seven messages. 1YB advises that they will soon be going with a 500 watt C.W. set, with an antenna 100 feet high, on a 100 foot building. This set should work Asia. 1CIK comes forward with a report of some DX work as far as 5FV. Their's is a 20 watt C.W. set.

VERMONT: Vermont has also come into line, and Mr. R. P. Slayton of the University of Vermont has been appointed Assistant Division Manager for this state. We now look forward to some good snappy reports from this district. Mr. Slayton has divided the state into two districts, a northern and southern, and has appointed Jennings. 1AIQ, the District Superintendent of the Northern, and Eaton, 1CJH, District Superintendent of the Southern district.

Traffic handling stations are 1ARY, 1AIQ, and 1BHC.

MASSACHUSETTS: This old state still continues to bubble and boil over with amateur enthusiasm, till now, it well sounds like a mill pond full of C.W. peepers on an August night. As stated before, 1CNI spark, walks off with the honors in this state. He is closely followed by 1CMK, as if not to be outdone by a spark.

A. S. McLean, Assistant Division Manager for western Massachusetts, sends in a good report. He reports 1CMK using 100 watts and working the 6th district; also, the appointment of Bloom as District Superintendent for Holyoke district. 1AWW reports a noon schedule with 1BEA, at North Adams, and 1MY at Hartford, Conn. 1IL, 1CGR, 1BSJ. 1BWY, 1EO, 1BVR and 1BLN all handled a few messages and promise a full report next month.

Sylvester J. Connolly, of old 1MD, who gained fame working DX on one-quarter inch spark coil, heads the 1XX as their chief operator. It is also announced that 1XK holds a boiled owl's session every Friday night, from seven P. M. to nine A.M. 1XM announces that they are run-

ning on G.M.T. now. Our old friend and standby, Phil. Robinson, of 1CK, handled 110 messages. I'll bet he is glad he hasn't got to write this report up. 1BKQ deserves special mention for fine work done. 1DY will be on the job in a week or so, and we look for some good DX work from his direction. Not wishing to toot our own horn too loud, we wish to announce that 1ZE is ready with 750 watts, and a 200 volt, 1500 watt generator, giving off an antenna current of 18 amperes on 212 meters.

RHODE ISLAND: This little state still measures up to TNT standard. 1II would like to have a schedule with Massachusetts stations. 1AFR says that some C.W. hams are threatening to close him up because he uses a stone crusher, but so far, there is no such law, and we hardly believe he has any ground for fear. You C.W. men—be sports, don't, for goodness sake, start anything between hams. 1BVB reports rebuilding his O.T. and also a muffler for his spark, so as not to keep the neighborhood awake all night.

CONNECTICUT: As per usual, 1QP, is asleep at the switch, nothing being heard from him. However, one or two, who know this Reinartz tuner wizard, and his failings, slipped their reports in to ye Division Manager, by the underground route, and he takes pleasure in reporting 1AW with 743 messages. This report came in after a general razz from all over the country, that our Headquarters station was not on the air enough.

In conclusion, let me thank you all for your reports, and to add—do not fret, if they are not acknowledged, for there are more than five thousand daily different matters that require personal attention, and this report is only one of the them. We will do our very best to get you all. Let's put over 10,000 messages next month.

ONTARIO DIVISION

A. H. K. Russell, Mgr.

The Ontario Division is FB, boys, and we got there in the transatlantic prelims too. Two of our stations copied in Honolulu and reports to date indicate that six others at least qualified.

In Western Ontario, which looks as if it was going to take away the Ontario Division honors, 3GN-9BS runs a regular schedule with 8BGT clearing west bound traffic. In London the only one who is on regularly is 3XN who is a big noise all over and handling much traffic. He has been appointed City Manager. Other London stations 9BF, 3OV and 3TB are yet in preliminary state. In St. Thomas, the only one is 3FA, who was working spark much to the disgust of the B.C.L.'s. He has changed over to C.W. with good results to himself, and the ears of the said B.C.L.'s.

In Windsor we have two big sets in 3BV, City Manager, and 3DH, both 100 watts, and doing excellent work, (which I wish they would tell me about—D.M.) 3DH and 3XN are QSA in California. Others in the western district are 3AD, 3NB, 3KO, 3FM. 3NB, was copied on Pacific coast during the prelims. 3TA in Tillsonburg, local Manager, is going strong with 5 watts.

In Central Ontario district, GOSH. Well—the boys are good, that's all. 9AL and 9AW reported from Hawaii during prelims and 3GK, 3GE (spark), 3JK, 3JT, 3CO, all pushed the old bottles to the tune of over 1200 miles. The said 3JK used ten watts for his trip to California. The boys are right there with the traffic handling too and they have helped to again break the record of the Ontario Division for traffic, even though we haven't the message report of the western district to help it along.

Eastern Ontario is still low man in Ontario. No real DX is being done there and comparatively few new prospects. 3IL has a big mast and 20 watts C.W. but is not yet on the air for work.

NORTHWESTERN DIVISION

H. F. Mason, Mgr.

For the first time in months, we have reports from all states. This month seems to mark the beginning of a new era in amateur radio in this division. Traffic is being moved on C.W. and message reports are pouring in. In the past, although we managed to get traffic through, it was hard going as a rule, owing to the long distances between the reliable stations and the QSS and QRM. Traffic is going thru so well, and with so little delay, that the problem of routes takes care of itself. Some stations, by their operating ability, higher power, and good watches gradually are being looked to as traffic clearing stations, and these stations in turn naturally pick their most reliable station in each direction to handle the bulk of the relay traffic on schedule.

There are also a large number of stations, mostly 5 or 10 watt C.W. stations, who experiment, and handle a little traffic, but not with any particular station, or on any schedule. Honestly, these stations are getting to be so numerous, and are so scattered, that we find it hard to count them in on our relay organization. However, they are the big stations of the future, and we extend a hearty welcome to every little five watt tube on the air as a step towards a more perfect organization of our division. So if you are not now reporting activities, get in touch with one of the division officers, and they will help in every way possible to get DX out of your set and become a dependable relay station. Get the A.R.R.L. spirit, fellows, and co-operate. Its FB.

Now that we are moving traffic so well, let's advertise the service we are giving the public. Explain our system to the B.C.L.'s and get their messages. It helps wonderfully. There are dozens or more stations on that can put traffic through. The route; 7BJ-7BK to 7OT, thence to 7LU seems to be the slipperiest, and once started on this route, nothing can stop a message until it is delivered or else goes out of the division.

MONTANA: 7EX is still supporting us and will be counted on all winter, with both spark and C.W. 7ZU has a new 150 watt C.W. He is maintaining schedules with 9AWM and 9CNS. 7LY is back on the air, and can QSR east and west, spark or C.W. 7HS has signed on as 2nd Op. and this stations is open for traffic every night. 7HM is very consistent throughout the division.

IDAHO, Dist. 1: The only station doing relay work in this district is 7JF. Dist. 3; 7CG and 7LN sent the reports of the Nampa-Boise football game to 7YA at Boise, where they were broadcasted. Stations in Nampa are generally inactive at present. Dist. 4: Stations handling traffic are 7PJ and 7LO on spark, and 7AEM, 7HJ, and 7OT on C.W. Boise is an important relay point for traffic in this division because of its central location.

OREGON: Efforts up to the present time to fill the office of Assistant Division Manager for Oregon have been fruitless. Although there seems to be quite a bit of activity on the part of individual station, the general spirit of co-operation does not seem to prevail to the extent that it usually does. It's up to you, fellows, put your shoulders to the wheel.

District 1; Stations handling traffic are 7JW, 7DP and 7BB. 7BB has just moved to Billings. Show the good old A.R.R.L. spirit, fellows, and co-operate 100%. Don't be stagnant. There's a vacant space in QST for your report each month. Fill it. Dist. 2: 7KS and 7SN are installing C.W. 7ABU is coming to the front. Trouble is being experienced at 7HD in working out, on account of QSS. (Better put in C.W., OM—D.M.) Dist. 3: 7QT and 7YJ are reported as doing DX, with 7MU also handling messages. 7BH is on with 5 watts regardless of matrimonial troubles. Dist. 5: 7LR, 7TW, and 7MF are all doing good work on C.W. 7TQ is a regular piece of furniture on the air, as he is sure on the job. Dist. 7: 7KE has a five watt set in operation and has already done DX work, having been reported in Waterloo, Iowa. 7MC is handling traffic on $\frac{1}{2}$ K.W. spark.

WASHINGTON: There has been a great increase in traffic in this section during the past month. Many new stations are coming on the air and messages are begin-

ning to move over definite routes. Kitsap County has been made a separate district, and will be known as No. 13. 7OE is District Superintendent and is sure right when he says that there's a bunch of stations in Bremerton that are hard to beat. F.B. Dist. 1: 7OJ is handling traffic on spark. 7GP is the only station reaching out of Olympia, as far as we can tell. Dist. 5: 7BJ has worked as far east as Kansas City (even though it costs a new disc on that synk rectifier every day.) (hi. D.M.) He reports 7ZK, 7AIC and 7BJ handling traffic in Vancouver. The route east is better than ever before. 7HJ at Boise seems to be working out on his C.W. Dist. 6: 7AW, 7BG and 7AFN, also 7AGI are handling business on spark, while 7WM, BT3, and 7QE are holding down the C.W. end of the game. 7WM's 50 watt bottle has departed to the great beyond (we can't say which place). BT3 at Camp Lewis is doing fine work with 20 watts working north to Canada 9AC, east to 7LU, and south to 7ZK. One of the original old timers of the any-wave, any-power ways is back on the air with 20 watts of C.W. He will sign 7AI and will be remembered by old timers as "Hammond of Tacoma." Dist. 7: Traffic in the Seattle district was moved almost wholly on C.W. this month. 7BK has 20 watts and finds that traffic moves in a way the spark never thought of. (We live and learn, 'eh!—T. M.) 7FD is breaking through on 50 watts. 7EQ, 7PF and 7ABB are holding down the job in Everett. On November 23rd, 7UU turned in at night and left four messages each with the check 13 on the hook uncleared. Next morning he awoke to find the top 40 feet of the 108 footer in his back yard, reclining peacefully. Others who are superstitious would do well to profit by this example. Dist. 8: This district includes the counties of San Juan, Skagit and Whatcom. Dist. 9: This district takes in the territory of Okanogan, Ferry, Stevens, Douglas, Chelan, and Pend Oreille counties. Dist. 10: This is dormant as far as A.R.R.L. activities are concerned. Come on your Yakima fellows. Don't let a few dollars derived from the broadcasting craze keep you out of the great game. Dist. 11: 7TH has been appointed an official relay station, and works regularly with 4BV and 7ZO, so give him a share of your eastern traffic, fellows. 7GE has moved to 110 South 7th St., Pasco, and will be on shortly with C.W. He says the spark will stay, tho it's too good to discard yet. (Willit?) Dist. 12: The work around Spokane seems to be entirely local. We've got a place in QST for your report though, and we're after 'em, so don't be bashful.

Dist. 13: During the past month, amateur activities in this district have taken

on fresh impetus. Message traffic is increasing daily, as the public becomes acquainted with our service. At present 7NG and 7OE are the only ones doing any amount of DX. The spark stations in this vicinity are changing over to C.W. as they find the latter far better owing to the close proximity to NPC. Some of the stations are using 110 volt lighting AC on the plates and are getting through to Seattle very well.

PACIFIC DIVISION

J. V. Wise, Mgr.

There are three trunk lines in the Pacific Division, known as trunk A, B, and C. Trunk A, from the southern extremity of the division via Douglas, Phoenix, Ariz.; San Diego, Santa Barbara; the Bay cities, Colusa, and north to the extremity on the northern end of the division. The following stations so far are appointed on trunk A. 6ZZ, 6ZH, 6ZB, 6AAK, 6TU, 6VX, 6AOR, 6AK, 6ABX, 6TC, and 6CC. Trunk B, from Douglas, Ariz. via Los Angeles to Colusa, Calif. Stations, 6ZZ, 6EN, 6ZX, 6GR, 6GF, 6TC and 6CC. Trunk C from San Francisco to the eastern extremity of the division. Stations 6ZAF, 6HP, 6AK, 6ZX, 6FH, 6AJR and 6QR. As the appointments on the trunk lines are made the same will appear in the following report.

ARIZONA: H. L. Gooding is appointed A.D.M. of this state. His station 6ZZ is a 100 watt C.W. working on both 200 and 375 meters. The districts in Arizona will be laid out by him in the next report. 6ZD and 6AAH, the former C.W. on 200 and 375, and the latter a spark on 200, are on the job doing good work. All routes via this state are in splendid working shape.

CALIFORNIA: Dist 1: 6AHF has junked his spark for a 50 watt lamp. In this district as in nearly all, C.W. greatly outnumbers the spark. 6AVR is both C.W. and spark. 6IV, C.W. only. 6AIH will be known as 6ZH and is working on 200 and 375 meters, pure C.W. being used. The fellows of San Diego are learning the advantages of co-operation. Thus our old trouble is being smoothed over. Dist. 2: The total of 747 messages is self-evidence of activity among the fellows in this district. A few points of interest: 6CU has worked 9UU, 9AWM, and Can. 4BV on 3 five watters. Our old friend 6IS has given up radio for a wife. Dist. 4: 6ATC and 6UW are doing fine DX with their tube sets. 6TU and 6VX both spark are also doing their share of work. Traffic north goes through 7BK, south to any Los Angeles station, and to the immediate bay points, via 6AOR. 6AUU gets on the job occasionally, otherwise Santa Cruz remains dead. Dist. 5: 6AS, has resigned his office as district superintendent due to

lack of time to give to radio. His successor will be named in next report. Dist. 6: The spark still leads in the message report in this district. 6ALV and 6ABU are on the job doing fine work. 6EX and 6AQU are clearing 6ZAC. 6VK is off the air rebuilding. For C.W. 6ASJ, 6CP, 6AOR, 6BCR, 6BSZ, and 6TI are doing the best of work. 6ASJ is handling traffic on schedule with 9's. 6BCR, 6BSA and 6CP clear with 6ZAC with ease. H. Becker, 1512 Oxford Ave., Berkeley, Calif., is Assistant City Manager of Greater Oakland. Between Becker, Steffen, City Manager, and Pooge, district superintendent, we should have a healthy report, if the fellows will give any one of them a few words of interest each month. 6HP is now C.W. the old spark gone the way of such animals. Dist. 7: There are only one or two spark sets left in this entire district. 6ABX has 2 50's in operation. 6GF and 6GR are 20 and 30 watts, respectively, pure C.W. having done away with the A.C. idea. All routes in perfect working order. Dist. 8: The only two stations working are 6CC and 6TC, both 100 watt C.W. 6CC is handling traffic with 6ZAC on schedule.

NEVADA: 6QR has been appointed A.D.M. He is again with us on the air with the old rock crusher. 6AJR is now completing his C.W. outfit of 50 watts. The arrangement of districts will appear in the next report.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Our box for this month is a repetition of the last one.

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*****
*               *
*      Spark    *
*  Stealey and *
*  Parkesburg, *
*    361 msgs.  *
*               *
*      C.W.     *
*    A. B. Brown,*
*    Norfolk, Va.*
*    284 msgs.  *
*               *
*****

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PORTO RICO: A.D.M. Rexach sends us his first report in this capacity. He says that with the inauguration of the traffic route with Continental U. S. on September 15th great increase in interest has been shown by the Porto Rican Amateurs in the activity of the A.R.R.L. 4JE has just received all the necessary equipment for a new 200 watt set. This will give Porto Rico another dependable station capable of handling traffic directly with the mainland. 4KT has been able to reach the U.S. and is reported QSA and steady by 3BZ.

WEST VIRGINIA: Reports for the past month have been very good. Dist. 1: There are five active stations in this dis-

trict: 8SP and 8AFD, running neck and neck with 8AUE. 8CHO managed to get in some daylight work. Dist. 3: Only one station is working here, 8CAY. Dist. 4: 8AMD is too busy at School to give much time to the set. Dist. 5: 8BKE says that he has been heard in 24 west coast stations. 8BDB has "9initis" which is keeping him busy. Two new stations are coming up, 8BXM and 8CQH. Dist. 6: This is spark headquarters. 6BDA has been reported by 6AKT, 6ZX, 6EX, 7LR, 7ZU, 7ADJ, and Porto Rico. 8IC another and 8TH, spark, have been getting good DX. We wonder if there are any B.C.L.'s in this neighborhood. They must live an awful life amid all that spark traffic.

NORTH CAROLINA: We have no detailed report. 4FT, and 4BX are suffering from the B.C.L.'s. 4KC and 4GH are very active. 4LJ turned in his largest traffic report since opening up in Winston-Salem. 4DQ, 4DC and 4GW are all active, and 4NT is very much so.

VIRGINIA: We have reports from every section except Richmond proper. Virginia leads the division this month with a total of over 1500 messages. This is the largest traffic report this state has ever had and is only an indication of the great work to be carried on this winter. Our technical advisor, Groves, 3BID has just put up a beverage wire 1100 ft. long. Dist. 1: 3ZZ has been very active and getting exceptional DX. He has a good bit of trouble with excessive fading of his signals. 3AAG is doing the boiled owl stuff. 3BBC is handling a great deal of traffic with Richmond on Sunday. 3BNE is going good after erecting a new aerial. The only spark in this district 3ACK is moving to Roanoke and will open up with a 10 watt C.W. 3ATZ is getting out, but business interferes with his work. Dist. 2: This bunch is very much alive now and handling more traffic than ever before; the largest portion of it being in daylight. All the Richmond bunch get on during the day and all over the Roanoke Division practically every station is on during Sunday afternoon, much traffic being handled. 3AUU, 3BNM, 3ATB, and 3SG are all live wires. 3SG is R. E. Decker, at Petersburg, and not as listed in the call book. 3TJ has been logged at 4OI and will start the boiled owl stunt and handle more traffic. Richmond has the usual kicks from the B.L.'s wanting everything to shut down for them, but ND. Dist. 4: 3BLF is using his 100 watt set with MG supply. He is working in all directions but Washington. By maintaining a daylight schedule with 3APR much traffic is handled. Dist. 5: 3IW is still handling a big bunch of traffic. 3SK with 100 watts has just opened up. 3AFW is getting out and is increasing to 15 watts. 3CER has just completed a new shack and

set. Dist. 6: 3BHL is on the job every night and wants all traffic for Charlottesville, Va. 3BFE fell from B.L. to the C.W. stuff at one jump. Dist. 7: 3ZK is out with a busted condenser. 3ASP is now using C.W. and handling traffic right along. He is specializing on daylight work and is reported all over Virginia. Dist. 8: 3APR works a great deal in daylight and after midnight. He is QSO all over Virginia and North Carolina on Sunday afternoon. 3BZ is very active handling quite a lot of traffic. He is now on 200 flat and has difficulty in raising stations that he formerly worked. Dist. 9: There are two new C.W. transmitters, 3CW and 3AIR. 3RF is back on the job much to the discomfort of the R.L.'s. 3BJI is back in the game with a 20 watt C.W., I.C.W., and phone. (FB. but use the C.W. most please). 3CA is doing a great deal of daylight work especially with 3BZ. Dist. 10: 3AOV still sticks to the spark. How about that station in Pocahontas? Let's get 3BWY on the "radio map" with the rest of the gang. Your Division Manager is highly gratified with the great relay work the fellows are doing and firmly believes that he could boost our traffic up to 4,000 a month having gone well over the 3,000 mark this time. Go to it.

ROCKY MOUNTAIN DIVISION N. R. Hood, Mgr.

Up and at 'em men, we're coming with horns a blowing. We had a tune of 1633 messages for November and our goal for January is 1800. Blow your Bazoos as hard as any jazz band ever thought of doing. We amateurs have our rightful place in the wind and we are going to keep it. We have our plan of quiet hours now. Let no petty single circuit grumbler squelch that sig of yours. We will have to fight men; and hold the ship, because she ain't a leaking yet. This old division has the pep of any wild cowpuncher, we are red blooded out here among mountains and sage brush so shoot 'em up in the old style. What say, do we make it? We will have to kick up dust, but we have the stations and the men behind them so the job can be done. Colo. and Wyo. is 100% C.W. and Utah is about 75% C.W. Now step on it, remember it is 1800 for January or bust. There will be lots of Xmas and New Year messages then which should swell our totals. Chronic keyitis is a good disease as long as it is moving traffic. Remember your local plan of quiet hours and the minute it is up hop to it if it does hit "Aida" or "Faust" in the middle of a scene.

From now on the states in this division will be run in competition to each other, each fighting for first place, the winner for each month will be decided by the num-

ber of messages handled per station. In this way each state will have a fair chance. So it behooves every mothers son of us now to get behind our A.D.M. or Dist. Supt. to put our state on top. The state that leads for the month will be listed first in the report and so marked. Watch for your place and if you do not rest on top of the gang, just go at it a little harder. Also behold our special box seat for the individual traffic honors. It goes to 9ZAF this time. We have several broadcasting stations in this division handling traffic and more power to 'em. 6ZM also KZN in Salt Lake is another of our good broadcasting stations handling A.R.R.L. traffic. More power to you men you lie deep in the hearts of us hams for it. So hop to it, gang, this division has just "gotta" fizz and pop from now on.

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*****
*               *
*   Colorado   *
* Reynolds Radio Co. *
*   9ZAF       *
* Denver, Colo, 536 msgs. *
*               *
*****
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Colorado has emerged from a so called "dead relay station state." This is proven by the message report for November. Compare it with all previous reports in the history of the division and see for yourself. Denver still holds honors for the most messages handled. But the great number of stations in the city account for their totals. Boulder and Colorado Springs look like very promising competitors. 9BUN using one five watt tube is doing a wonderfully fine job of papering his room with cards and messages handled. Then comes 9DTE who is 9BUN's close second. When one hears him locally they think that it is one of the so-called "Transmitting receiving combinations" or in "ham language" a blooming single circuit receiver." But when he calls 9DTE gets an answer and it isn't South Denver or Englewood either. The old Manual High School received the call 9ECF. The old timers 9DTM, 9AMB, 9ZAF, etc. still hold the fort in Denver in the same old way.

WYOMING. Radio activity seems to be up to par, all stations in operation now, ready to make Wyoming's largest and best radio season. 7GK has moved his spark set to Laramie and has it installed at the State University. A 10 watt C.W. set is used at 7GK also and the power will be increased. Old man 7ZV is back on the air with 100 watts and his sigs are already QSA over the entire U.S. 7AFW has been experimenting with phone lately and during the A.R.R.L. tests was QSA in Buffalo, N. Y. on 10 watts. With the Voluntary Lid taking effect most of the stations in this section are finding it necessary to revise schedules to avoid confusion and con-

fusions and as soon as these difficulties are adjusted everyone will be ready for the season and show just what Wyoming stations can do. Daylight storm routes run through Wyoming which are being extended into Colorado which will give this division a route paralleling the railroads from Denver, Colo., to Billings, Mont.

UTAH: The men in Northern Utah do not seem to be giving their District Superintendent any support at all. There will have to be some pep shown up there, gang, or we never will lead the states in this division. (Some official relay stations will be minus a certificate if some interest is not shown—D.M.) 6ZT is on the air now. Dist. 2: Traffic came through this month better, although 50% of the stations handled traffic and just a few stations reported. 6ATQ got through fifty messages in fifteen nites. 6BKE continues with his rock crusher. (Things have to move faster in this division from now on and those who do their part will receive due credit—D.M.)

WEST GULF DIVISION F. M. Corlett, Mgr.

It seems that the Division Manager's efforts of pounding the faithful old Corona instead of the brass on the old rock crusher is beginning to bring results in boosting the message traffic. Well I am glad to see it fellows, and keep up the good work, but honestly I am just aching to get a chance to sit and handle a few like old times. Can't make a living, get a little "shut eye," write letters and more letters, and operate the old set too, there are not enough hours in a day. Used to have one or two girl friends that used to write to me, but I think they have all given it up as a bad job, they never get an answer. Northern Texas got away with first place last month.

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*****
*               *
*   Gray & Gray *
*   5XAD—329 msg. *
*               *
*****
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NORTHERN TEXAS: 5EL is getting reports from all over the country (our sympathy with you OM for the last of your noble 5 watter, better luck to you next time.) 5UN is being reported from both coasts. 5CY on his 5 watts is getting splendid DX reports. 5ZADA is getting everywhere with his 100 watts. 5HQ has just received his license and hasn't got started good yet. 5UO is being reported from both coasts. Wichita Falls' motto: "shoot us tfc, if we cant' handle it no one can." 5IX and 5TC are doing fine DX work. 5DI is confining most of his activities to handling long distance traffic with the west coast. He has schedules with 6AWT and 6JD every A.M. He also works 6KA of Los Angeles, has worked

4KC, 4EB, 3QV, Can. 3BV, and 4BP. His hours are from 3:30 to 6:30 A.M. 5PX and 5SK are doing good work. 5BE is out for the present rebuilding. 5QI is somewhat stale on account of football and bum generator.

The District Superintendent for district 1 is Arthur West, who is operating at 5TU. 5ACQ has been doing some real DX work on spark. 5IS has installed C.W. 5AL has had hard luck with his condenser but is sticking on the job with reduced power. 5ZH is anxious for traffic and will QSR for all western states and Hawaii. Traffic regular through 6ZZ, 9DSD, 9ABR, 5ACF and 5BA.

SOUTHERN TEXAS: With a certain degree of pride we make our report this month; all of the four districts in this section have turned in their reports on time and each of them have shown renewed interest in traffic work. This is that same feature of "rebuilding" which detracts so much from our efforts to make a good showing; seems as tho all the real good stations that we have down this way have the growing fever—the five watters of today will be 20 watters tomorrow, and so on. 5NK is bringing scores of reports home from all points, even Hawaii. District Superintendent E. A. Sahm at New Braunfels, reports 5KP as the honor station in his district this month. 5ZU with his "mile a minute" fist is working well up into Minnesota on a fifty watter. 5TM is working well up into "9dom" on 15 watts. 5YK is still operating spark on 375 meters with good DX results. District Superintendent L. D. Wall of San Antonio makes a snappy report telling of a 50 watter opening up at 5SS. This point is a most desired one in the extreme southwest as it gives easy access to Laredo and the Vally stations out of San Antonio, and especially with 5ADI. 5ZAE has got his C.W. set percolating. E. R. McCracken makes his first report and gives foremost credit to 5FA for traffic handled during the past month. 5ADB has given up the spark idea and will make a showing next report as a C.W. station. El Paso is one of the lucky (?) towns to have an amateur with a four letter call 5ZACA. Sounds like code practice. Hi. 5FT has been down in old Mexico and reports sigs good from 5FA and 5ZACA. EL Paso relay men have decided on a 9:30 P.M. (MST) to begin DX work as it will coincide with the (CST) of east Texas.

OKLAHOMA: 5WX seems to have given up the game for the winter. 5SR is working nicely but a great deal of traffic doesn't go through this station. 5SG has his 10 watt set running, although no DX records have been made. 5TO, 5LB, 5MP, 5ADQ, 5DW, 5AEC, and 5TA are off spark for life and are to stay with C.W., fact is, they

are all working further on one five watter than was ever possible with the old "light blinkers." 5ZM is the only other live station of this section and to him goes the credit of keeping things alive around Enid. 5ZZ and 5ZQ are away at school and 5PU hasn't been heard from for moons and moons. At Norman two new stations have begun to get out, 5TJ and 5VM. Believe us, you won't get much sleep if you try to stay up with 5TJ.

WINNIPEG DIVISION

J. A. Gjelhaug, Mgr.

MOOSE JAW: 4HH reports hearing 9AW or Toronto calling (U. S.) 4NT and we hear that 4BV of Loreburn was heard on the Atlantic Coast, so prospects look good for the "ALL CANADIAN Transcon" this season.

REGINA: Here we have C.W.'s in the stage of being built. 4AQ is getting a 10 watt bottle-set on the air and 4BR is reaching out with his English lantern.

LOREBURN: What is all this coming to, every time we hear from 4BV he has broken his last DX record, now he is being heard consistently by 6ZAC working 6XAD and 5SP, and has been heard at Yonkers. N. Y. Next thing we know he will be working French 8AB. More power to you OM.

SASKATOON: 4FB is having a little trouble but will have the set percolating soon. 4FN will be a 10 watt set.

WINNIPEG-MANITOBA: 4AS has sold his spark set and is thinking of C.W. 4CJ has 5 watts but did not get a chance to do much. 4CJ and 4CX are combining transmitters and will have 10 watts. 4DK has worked many stations in the states and has hooked up with 4BV. 4CN will have 50 watts going soon. 4CE is doing good work on his spark, having worked 9ZC of Baudette in daylight.

The Winnipeg gang are up to something as they say they will give the Saskatchewan end of the division a surprise before long. Go to it, fellows, and we will probably see that "ALL CANADIAN" Transcon come through soon.

VANCOUVER DIVISION

J. T. North, Jr. Mgr.

The "All-Canadian Route" is becoming less of a pipe dream these days as 4BV, 4GB, 3BV, and 3XN are QSA at 5CN and 5AK.

VANCOUVER: 5CN has worked 9AWM and 9AUL with little trouble, as well as many sixes and sevens. 5EJ is another C.W. station of promise, and 5EB will be on with 5 watts shortly. 5BQ is punishing the ammeter on ten watts but can't raise anyone across the border with any regularity. 5AK has his spark assembled.

(Concluded on page 59)



QRA WQL as WQM?

Our readers will recall many reports in QST of the reception by British amateurs of radiophone signals from stations WQL and WQM, first during last year's Transatlantics and on several occasions since. Now we have a letter from Mr. C. G. Williams, British 2JF at Sefton Park, Liverpool, England, with a copy of his log for Nov. 27th recording these stations:

11:48 WQM clg WQL—C.W.—215/225 m. Audibility 6. "WQL v WQM—Aerial current laaa2 1000 volts 45 milliamps—WQM".

11:52 "CQ v WQM—Here laaa2 amp in the aerial."

11:53 WQM on speech "Hello", etc. Speech audibility 4.

11:56 WQM "VA".

Mr. Williams indicates these times as G.M.T. but also speaks of "P.M.", from which we imagine he refers to 11:48 to 11:56 at night, London time.

These calls are assignable by the United States but as previously reported in our columns the Department of Commerce advises that there are no phone stations so licensed in this country. We can secure no information on them. Mr. Williams used a detector and 2 audio amplifiers and with such low audibilities it is reasonable to expect that the signals came from considerable distances—which is in line with the impression of other British amateurs who have heard the same stations.

Can anybody shed any light on this matter?

WJZ, the broadcasting station of the Westinghouse and Electric Manufacturing Co., at Newark, N. J., appears to be the most consistent broadcasting station in this country to be heard in England, judging from the logs of amateurs overseas. WJZ has been heard for two hours continuously in the afternoon and amateurs looking for our "Z" stations on 375 meters frequently run across WJZ.

Letter From France

This month we take pleasure in presenting a letter from Léon Deloy, French 8AB. This was of course written before the tests actually started and we know from the reports coming over at this writing that

dozens of our stations are being heard nightly in France.

Dear Brother Amateurs:

I have not much to say this month but the news is good. The December Transatlantic Tests have been given quite a lot of publicity in the great press and are arousing much interest. It can be safely said that the entrants for reception at least will be numerous.

Transmitters are being hurriedly put together and interesting results are being obtained, and at this writing half a dozen French stations have been reported from England and several French amateurs copy signals regularly from their British comrades. According to unofficial reports at hand several American stations have been heard in France during the preliminary tests.

Personally my 1 K.W. set is progressing. The new masts have been finished. The three in the yard are 25 meters high and the one on the roof is of 10 meters and the aerial will be up on them shortly.

I met Mr. Armstrong in Paris last month and he was awfully nice to me. He was in Nice a couple of weeks ago and honored 8AB by a long visit.

With best 73's to all and CUL,

Very sincerely yours,

Léon Deloy, French 8AB.

Nice, Nov. 19, 1922.

In our October number we gave a wrong impression in this department to the effect that Mr. Philip R. Coursey had left *The Wireless World & Radio Review* to go into the employ of the Dubilier Condenser Co., Ltd. Although with Dubilier as Chief Engineer he still retains the title of Research Editor on the magazine.

The station of the Manchester Wireless Society, 5MS, started broadcasting to us on November 14th for the first fifteen minutes of each hour, starting at 8 P.M. E.S.T. and ending at 1:15 A.M. with a wave length of 270 meters. At this writing no definite reception has been reported in America but only half power has been used so far. Although we look for the best signals from this station there are other stations in England which should make themselves heard.

London Letter

Dear Friends:

You may be interested to know that we have just set up a new record for low power telephony, carrying on inter-communication for one and a half hours between London station 2ON, Major Parker, and Aberdeen station 2JZ, Captain Spence, on a wave of 195 meters. The power input was 50 watts, antenna current $1\frac{1}{4}$ amperes, aërials 45 to 50 feet high x 60 feet long, and earth made to the main water pipes. I personally supervised the tests and listened with the first two valves of a Burndept Ultra III; that is to say, a H.F. magnifier and rectifier. The distance is somewhat over 500 miles and Aberdeen is surrounded by mountains. The whole of the communication was perfect and not accompanied by any tendency to fade.

You may also be interested to hear that 2JZ sent C.W. telegraphy to Mr. Deloy, 8AB, Nice, France, where he was received on one valve. This is a distance of approximately 1000 miles so it would seem, therefore, a comparatively easy matter to send C.W. telegraphy across the ocean using one kilowatt on a properly designed aerial and counterpoise system.

One transmitting tube only was used on each of the transmitting sets and telephony was done on the grid control system, no modulation tubes being used.

Broadcasting is now controlled by the Broadcast Company which has been formed for this purpose. Shares are being sold to all manufacturers but the Post Office is stipulating that the maximum dividend to be paid is $7\frac{1}{2}$ per cent. No manufacturer will be allowed to sell apparatus for broadcast reception unless he has shares in the scheme, and of course must also be licensed under the Marconi patents. For revenue, a tax on all receiving sets, loud speakers, head telephones, etc., will have to be paid the Broadcast Company, this tax being in the neighborhood of 7/6d for each crystal set up to about £3 for a four-valve set. If it is found at the end of a year that these charges are too high they will be reduced but it is estimated the cost of running the eight broadcast stations will be in the neighborhood of £20,000 each per annum. The proposed broadcast stations will be located at the following centres: Bristol, London, Manchester, Plymouth, Glasgow, Birmingham, and Newcastle. The power of each station will be about three kilowatts and the wave length 350 to 425 metres. The cost of operating may appear to be very high but you must bear in mind that in this country we have a great many vested interests, e.g., there is the music copyright association demanding payment for the singing of their songs and performing their operas, artists fees and over-riding fees in cases where artists are retained by theatrical impressarios or music

hall controllers. However, we shall see how it all turns out.

All apparatus designed for the reception of broadcasting will have to have the British Broadcast Company's badge and must be passed by the Post Office as being suitable for the purpose and will also bear the Post Office registered number. Although these sets may be adapted to receive on any wave length, they must not, on any account, contain reaction, tickler coils, or regeneration of any sort, so that in order to receive C.W. telegraphy a separate heterodyne must be used. The Post Office is now taking a firm hand in the issuing of amateur and experimental licenses. Anybody may purchase a broadcast license from any Post Office and with this license may use broadcast apparatus only. The amateur and experimenter must apply to the Post Office for his license which will enable him to use regenerative circuits but he will have to show that he knows something about wireless and must give some reason for his wish to experiment. This system will have its advantages inasmuch as the ether will be kept clear of continuous screeching and heterodyning which goes on when regenerating valves are used, and it will encourage the production of super sets using radio frequency amplification.

This, I believe, covers the situation here as it now stands. Before many weeks I hope we will be sending personal messages by C.W. across the seas instead of letters.

Very sincerely yours,
W. W. Burnham.

First Ham: "Sa Bill, is the average British amateur much good at receiving?"
Second Ham: "Coursey's all right."

The *Wireless Society of London* is changing its name the first of the year to the *Radio Society of Great Britain*.

THE OPERATING DEPARTMENT

(Concluded from page 57)

VANCOUVER ISLAND: This is an extension of the former Duncan district and W. F. Reeves, 5CT, is D. S. 5CT is the only active station at present as 9BG and 5DX in Victoria are putting up new aërials. 5DX handles some traffic. 5CT reports DX with 4DQ difficult on account of QRM, but as both stations are owned by resourceful men, the difficulty should soon be overcome.

ALBERTA: 4DQ, reports that he is lining up some DX stations. 4DQ says his normal range is 500 miles, and he has worked Portland, Ore. which shows that 5 watt transmitters are worth the price anyway.

PRINCE RUPERT: No report from 9BP, so we conclude he is tinkering up that 100 watter at every spare moment.

Who's Who in AMATEUR WIRELESS



J. V. WISE

Mr. J. Vance Wise, our Pacific Division Manager, was born in Oakland, California, in 1898 and first started in "wireless" with a string-line tin can phone when only a lad. Graduating to the telegraph, he ran a peanut line down to the local depot, with three instruments on the circuit. About three years later he found himself with a three-slide tuner and other alleged apparatus of the vintage of 1912.

In pre-war days many two letter calls were signed, until in 1915 the call 6VQ was landed. 6VQ was not a bad station for those days and was heard in six states. After the war the call was 6EJ, which was reported heard in eleven states. 6ZX is the present call and it has so far drifted over half the country, Honolulu, up the coast to Alaska, and 2600 miles south of San Francisco, the station being 40 miles northeast of San Francisco. Wise has passed thru the many stages of the modern

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A. A. HEBERT

Mr. Arthur A. Hebert, president of the Ulster Foundry Corporation, while well known in the foundry field is equally well known in amateur radio. Educated as a mechanical and foundry engineer, in 1906 he took up the study of wireless as a pastime, whereby he rates as a real old-timer; and since 1908 he has taken an active interest in all affairs relating to the improvement of short-wave relay communication.

Of course he is a pioneer in our A.R. R.L., at present being both Director and Treasurer, the watch-dog of the finances. In our earlier days, between the formation of our original Board of Direction and the reorganization providing for a titled Traffic Manager, which went into effect just before America entered the World War, Mr. Hebert was the General Manager of the A.R.R.L. and in active charge of all the field work, in which time he rendered ser-

(Concluded on page 67)



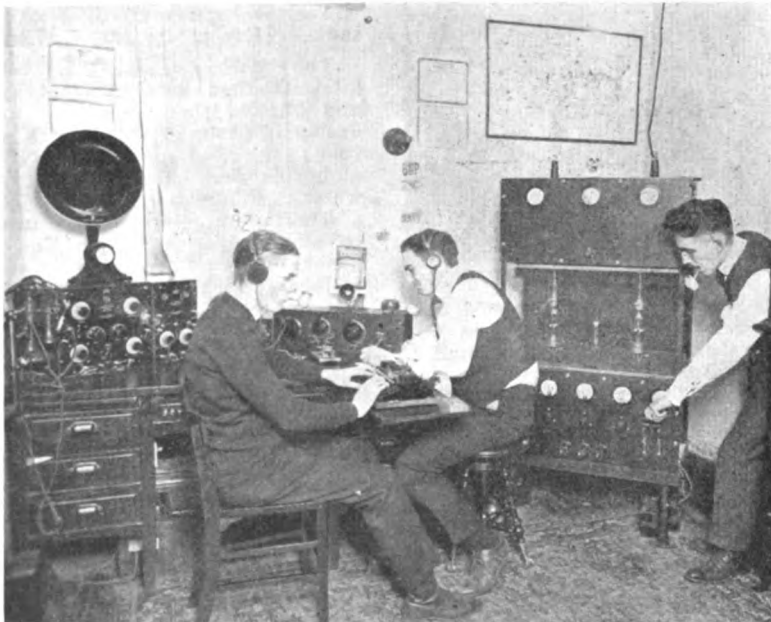
Amateur Radio Stations



9ZAF, Denver, Colo.

9ZAF is the station of Dr. Wm. D. Reynolds, Jr., president of the Reynolds Radio Co., of Denver, Colo. 9ZAF, ex 9WH and 9JE, is one of the pioneer amateur stations of the west. It was the first station to send out daily news bulletins by phone in this territory and later as KLZ was the first commercial broadcasting station in the Rocky Mountain Region.

cage is made up of a top strand of steel cable supporting the five strands of copper cable. This top steel strand supports the weight of the rings and the heavy copper wires with practically no sag. A small cage lead-in is brought from each horizontal cage and joined together making a Y about 15 feet below. From this junction a single 8-inch cage passes direct



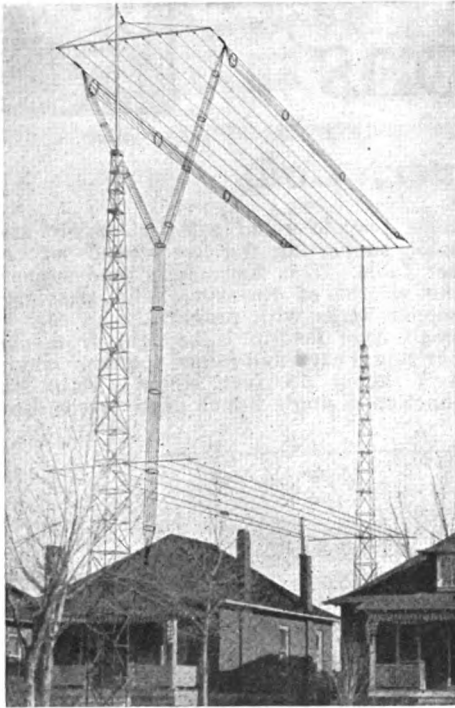
The transmitter was constructed by the operators at 9ZAF and is a composite phone and telegraph set. It uses two 250-watt tubes and a 50-watt voice amplifier for phone. On C.W. it uses a single 250-watt tube or two in parallel. The hook-up is a modified Meissner circuit giving an antenna current of six amperes. When used as phone a 50-watt voice amplifier is used in conjunction with the Heising system of modulation.

The antenna is an "L" type double cage eighty feet high and ninety feet long. Each

to the transmitter. A large fan counterpoise composed of twenty No. 14 bare copper wires runs over the house to the back yard. The counterpoise is used exclusively.

The towers are 60 feet high with a 20 foot pole on top making a total height of 80 feet. They are constructed of 1½ inch pine braced with 1x2 braces. They taper from a four foot base to a one foot top. The towers were built in three twenty foot sections which were bolted together on the ground and raised in one piece by means of a thirty foot "gin" pole.

For receiving a Grebe CR-8 and a Kennedy 220 are used on a single wire aerial 85 feet long and 30 feet high.



9ZAF is the gateway to the west coast and handles west coast traffic from Canada to the Gulf. The operating staff of the station consists of three men all of whom hold commercial licenses. They are from left to right, Thompson (TH), Carpenter (DX), and Dr. W. D. Reynolds (DR). 9ZAF has been reported on C.W. from every district and on voice as KLZ from 50 states and provinces of the U. S., Canada, Mexico, and Apia, Samoa, which is more distant than England.

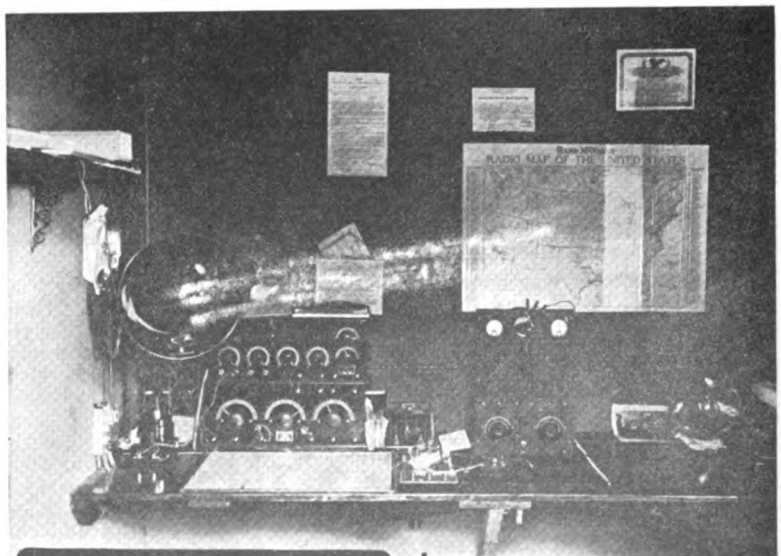
8BAS, Antwerp, Ohio

Station 8BAS, located at Antwerp, Ohio, is owned and operated by Herbert L. Gordon, and is a very neat arrangement.

The antenna is of the inverted L type, containing four 7-22 cables spaced two feet apart. It is 60 ft. high and 50 ft. long and is well insulated. The ground system is composed of copper strips buried three feet underground and a wire soldered to a well nearby.

The receiving equipment comprises a Z-NITH CRL regenerator and an AGN-3 Amplifon with three steps of audio amplification. Either Murdock phones or the Magnavox may be used. The 6-volt storage battery and Tungar rectifier are located behind the partition, which is a convenient feature as it makes the leads short and eliminates the possibility of the acid eating away the bottom of the operator's trousers, as is too often the case where the battery sits under the operating table. (Except for the J. O.'s)

The spark set at 8BAS was a husky kilowatt that kept the neighbors awake and blinked their lights, so it was withdrawn in favor of C.W. Now a neat little tube set of Benwood manufacture sits alongside and chirps to the tune of 15-watts. Filament voltage is supplied by a Thordarson step-down transformer delivering 8-volts A.C. An Emerson motor-generator rated at 250-watts and 600-volts is located beneath the transmitter. Judging by the dog-eared call book and the messages on the hook, this is a typical amateur station.



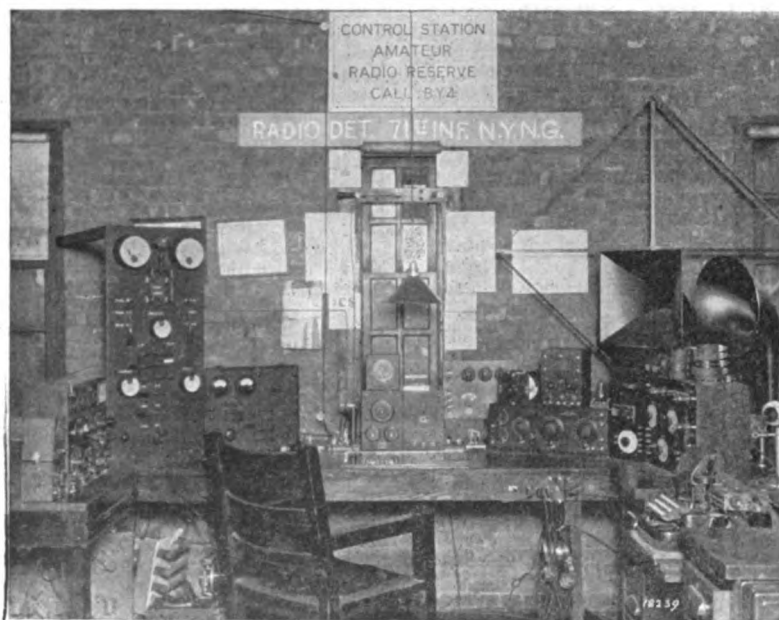
BY4, New York City

The Headquarters Company of the 71st Infantry, N. Y. N. G., at the Park Avenue and 84th Street Armory has taken over the control and operation of the Amateur Radio Reserve Net of the Second Corp Area, U.S.A. This net consists of Amateur stations whose owners are members of the reserve and provides a means of communication via amateur relay with all the important military centers in the Eastern States.

The apparatus was installed by the Headquarters Company of the 71st Regiment.

To the left of the antenna switch there is first a 250 to 500 meter tube transmitter using a 5 watt speech amplifier, a 50 watt modulator and a 50 watt oscillator operating on a 12 volt storage battery that supplies the filaments and operates a 750 volt dynamotor for plate supply. A single switch provides for the use of C.W., I.C.W. or phone. This set has been reported QSA thru the entire Eastern half of the United States.

Next is the switchboard carrying all the station controls except the antenna switch. From this board are handled the charging of the batteries, the transfer of the antenna to the sending set in use at the mo-



An emergency storage battery is provided so that the station may operate intermittently for ten hours after the city power is interrupted.

Beginning at the antenna switch in the center of the photo and going to the right, the first set is a Westinghouse "R C" with associated two step audio amplifier. Next (just behind the keys) is a Western Electric two step audio amplifier used in conjunction with the loud speakers on whatever set may be operating at the time. Next is an Adams series Morgan "R A 10" with an antenna series condenser, detector and two step audio amplifier on top. The amplifier looks like a Navy type SE 1000. Last to the right is a universal-wave set used with honey-comb-coils on long waves or with a "Tunit" on short waves. This set was built by the H. Q. Company.

ment and the power supply from the batteries and the line.

To the left of the switchboard is the familiar Western Electric 5 watt phone set, Signal Corps type BC32A. This set employs a 5 watt modulator and 5 watt oscillator, for speech transmission over short ranges at waves from 500 to 1100 meters. Built into the set-box is a tuner with detector and three steps of audio amplification.

The antenna at BY4 is a cage, 100 feet long, suspended from the armory tower.

Operators who are interested in joining the Amateur Radio Reserve are requested to communicate with Lt. Layng of the 71st Regiment, or to call at the Armory personally on a Tuesday or Friday night.



It gives us great pleasure to announce the affiliation of the following societies as of December 8, 1922:

Germantown High School Club, D. K. Kinnier, President, W. E. Gilbert, Secretary; Pioneer Radio Society, Cyril Rooks, President, A. C. Gary, Secretary; Southeast Missouri Radio Assn., H. B. Deal, President, E. J. Furlong, Secretary; Lorain Radio Assn., L. Kress President, J. Perusek, Secretary; Kitchener & Waterloo Radio Club, G. Hainsworth, President, H. H. Gowan, Secretary; Toledo Radio Club, R. J. Togel, President, E. E. Pearson, Secretary; Radio Club of Saskatoon, T. T. Fyfe, President, C. H. Pirie, Secretary; Kokomo Y.M.C.A. Radio Club, W. F. Lanterman, President, V. Guerin, Secretary; The Harding Radio Club, C. C. Whysall, President, C. B. Kerr, Secretary; Amateur Radio Operator's Club of Bremerton, W. R. Wood, President, E. Bailey, Secretary.

Olean Radio Club

New officers for the coming term are: T. Ryan, President, W. Brown, Secretary-Treasurer, A. Cameron, Traffic Manager.

At a meeting held November 16th the "Rochester Plan" was presented to the club, and was adopted by popular vote.

I Tappa Key Radio Club

At a recent election the following officers were elected for the coming term: M. Nicoll, President, H. Bennett, Secretary.

Asbury Park Radio Club

New Officers are as follows: F. Fisher, President, R. Conover, Vice-President, Treasurer C. Weaner, Secretary F. Clayton. The club recently adopted the A.R.R.L. policy of quiet air from 7:00 P.M. until 10:30 P.M.

Hub City Radio Assn.

The semi-annual election of officers was held on November 9th and the following men were elected: A. H. Rosvold, President, N. J. Lawson, Secretary-Treasurer, F. D. Chapman, Vice-President, T. F. Anderson, Corresponding Secretary. The A.R.R.L. policy of quiet air from 7:00 P.M. until 10:30 P.M. has been endorsed and is observed by members of this club.

The following societies elected new officers which list is given for the benefit of recording secretaries of other societies:

West Philadelphia Radio Assn.

G. Owens, President; R. Fach, Vice-Pres.; C. R. McLaughlin, Secy.-Treas.

Haddonfield Radio League

J. L. Barners, President; E. Braddock, Vice-President; J. T. Neath, Secretary; and T. O. Pierce, Treasurer.

Minersville Amateur Radio Assn.

H. A. Stokes, President; C. F. Connelly, Managing Secretary; W. C. Diehl, Publicity Director.

So. California Radio Assn.

H. Herringer, President; V. M. Bitts, Vice-President; C. Filstead, 2nd Vice-President; H. A. Duvall, Secretary; H. Fink, Treasurer.

Chelsea Radio Assn.

G. B. Latchford, President; J. Nason, Vice-President; N. Mazziotta, Treasurer; Secretary A. Rebert.

3rd District Radio Council

Convention plans are practically complete for the 3rd District Radio Convention which will be held in Baltimore, Friday and Saturday of the second week in April, 1923. The meeting place will be at the Belevedere Hotel. Information regarding the convention can be secured from H. A. Beale, Jr. (3ZO) Parkesburg, Pa.

The A.R.R.L. would like to see the entire gang at this convention, as it is expected it will be the biggest convention ever held in the 3rd district.

Hudson City Radio Club, Inc.

At a recent meeting Professor Myers, inventor of the Myers Tube delivered an interesting lecture on "Radio and Audio Frequency." A non-oscillating receiving set consisting of 4 steps of R.F., detector, and 3 step of A.F. was demonstrated, and on a 2 foot loop very good results were obtained. The code instruction has been started and members are being prepared for Government operators license.

St. Louis Radio Assn.

St. Louis Radio Association Plan for radio transmitters for the regulation of broadcast reception:

Monday, Wednesday, Friday and Saturday of each week all types of radio transmitters may operate from 6:00 A.M. to 7:00 P.M.

From 7:00 P.M. to 10:00 P.M. only straight C.W. and radio phones with good

modulation may operate. Spark and I.C.W. stations are not permitted to operate during this period.

From 10:00 P.M. to 6:00 A.M. all types of transmitters may operate under the regulations for radio traffic.

Tuesday, Thursday and Sunday of each week all types of radio transmitters may operate from 6:00 A.M. to 7:30 P.M.

From 7:30 P.M. to 11:30 P.M. absolute quiet will be observed. No transmitter of any type will be permitted to operate.

From 11:30 P.M. to 6:00 A.M. all types of transmitters may operate subject to the traffic regulations.

It is specifically stipulated that all amateur transmitters be on a legal wave and decrement as provided for in their U.S. Radio Licenses.

No amateur transmitter may operate at any time if he is tuned above his legal wave or decrement.

Poultney Executive Radio Council

The following schedule will hold in force unless arrangement is made by consent of its members until its use over a period of time proves unsuitable, and then it may be revised by a majority vote of the members.

6:00 A.M. to 11:55 A.M. free air
11:55 A.M. to 12:45 A.M. no traffic
12:45 P.M. to 7:45 P.M. free air
7:45 P.M. to 10:00 P.M. no traffic
10:00 P.M. to 6:00 A.M. DX transmission

Ithaca Radio Club

The following traffic schedule has been adopted by the Ithaca Radio Club:

7:00 A.M. to 11:55 A.M. working hours for all stations
11:55 A.M. to Noon quiet air
12:05 P.M. to 2:00 P.M. DX hours only
2:00 P.M. to 7:00 P.M. free air
8:00 P.M. to 10:10 P.M. quiet air
10:10 P.M. to 7:00 A.M. DX hours only

Southern Minnesota Radio Assn.

The Southern Minnesota Radio Association met in the Commercial Club Rooms at New Ulm, Minnesota. The following officers were elected: L. V. Berkner, President; J. Pfau, Vice-President; N. A. Canfield, Secy.-Treasurer.

The following traffic regulations were adopted:

Noon to 1:00 P.M. DX C.W. traffic only
1:00 P.M. to 7:00 P.M. free air
7:00 P.M. to 10:00 P.M. quiet air
10:00 P.M. to 6:00 A.M. DX only
6:00 A.M. to Noon free air.

Kansas City Cleans Up

The radio club of greater Kansas City has just done an excellent piece of construction work. Under the guidance of

Mr. Robert R. Moore, the President of the club, and Mr. L. B. Laizure (9RR) and Mr. Sidney J. Blum (9FM), traffic men, the club collected evidence against three outlaw stations in Kansas City. This was done by personal visits to the station, by listening in at various other stations, and by conversations with the operators of the outlaw stations. Because of the excellent shape in which the evidence had been put, Mr. Beane, 9th district Radio Inspector was able to proceed at once against the stations. The outlaws in question were all using low power phones, which, while they caused no tremendous interference, were yet outside the law and were both bad precedent and bad manners. They were stations "BB," "EP," and "SPR," operated respectively by Dr. Bebe, Edwin Price, and the South Prospect Auto Repair Company. The other two appear to be closed for keeps, but the operator of EP was not at home during the inspector's visit so that the place cannot yet be regarded as definitely closed. We hope he sees the handwriting on the wall.

Fine work, Kansas City.



The above is the exhibit of the Houston Radio Club at the Houston Fair and Exposition, Nov. 9th to 19th. Among other things, a complete station with the call letters 5TY was installed and operated, using 100 watts of C.W. From left to right the members are: Lynch, Melton, Chinaski, Quinby, Dupree, and Wright.

CLUBS wishing information on how to become affiliated with the American Radio Relay League can secure same by addressing a letter to the Traffic Manager, A.R. R.L., 1045 Main St., Hartford, Conn., who will be glad to furnish the necessary application blanks. There is no charge for affiliation. Every good radio club, society, or association is eligible for affiliation.

The Junior Operator

(A department formerly known as "With Our Radio Phone Listeners.")

What is DX?

In days gone by we used to think that a chap located in the central part of the country was lucky when he could hear amateurs on both coasts. Not so very long ago we thought it great to get a message across the continent and in January, 1921, with the co-operation of every amateur in the country, the A.R.R.L. put a message from Hartford to Los Angeles and received the answer back in Hartford in six and one-half minutes from the time the original message started. This was hailed as wonderful, not only because of the wonderful co-operation of the whole amateur world, but because of the few relays in handling the message over the then considered long jumps. This particular route was 1AW, Hartford, Conn.; 9ZN, Chicago, Ill.; 5ZA, Roswell, N. M.; and 6JD, Los Angeles, Calif. Then came the Transatlantic Tests and the excitement as to whether any American amateurs would be heard across the ocean, and lots of them were. Even handling a message across the country by amateur relays in daylight was impossible a short while ago. It is getting so that we are beginning to wonder what is the ultimate limit.

The advent of C.W. is of course responsible for most of this, as even the few remaining spark enthusiasts admit that C.W. reaches out on remarkably small input. Then, too, there are many more stations than in the old days and our knowledge of building and adjusting apparatus has improved. Our "Calls Heard" department was considered blessed not so very many months ago when it contained a few lists in which every district was heard. Now a list hardly gets printed unless it includes every district and amateurs in the central part of the country can hardly hear *far enough!* A few days ago a chap wrote us stating that his local paper featured someone as making a record by hearing 38 stations in one evening but that he (the writer) had heard 57 in one evening and notified us of this record. It so happened that a good "hammy" letter had drifted in the day previous from an amateur who casually said, "Rdo wx fb nw. Copied 124 stns last nite." We are inclined to think that around three hundred stations heard in one night would constitute a record, although we have not the slightest intention

of starting a competition to see who can hear the greatest number, as life is too short to try to *prove* the claims that would drift in to headquarters office.

But what we started to say was that whereas in the pre-war days a record consisted of being heard with a power of a "watt per mile," nowadays there are so many new and heretofore-thought-impossible stunts being pulled off that any record made is short-lived and we wonder what the end of this thing is really going to be.
—B.P.

Series-Parallel Switching

With a record of seven requests for the following in one week, we present two simple methods of switching a condenser from the position of being in series with the aerial to the shunt connection across the primary coil.

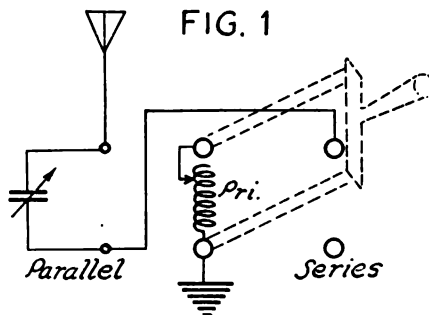
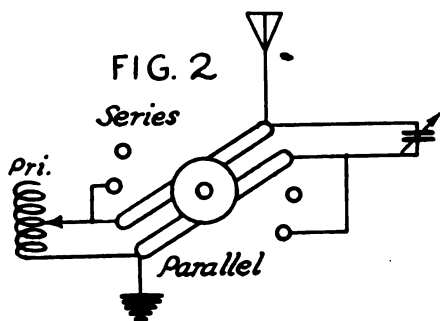


Fig. 1 shows the method of connection where a double-pole double-throw (D.P. D.T.) knife switch of the battery type is used. Exactly the same thing may be accomplished with a telephone key lever switch but it preferably should be of the "anti-capacity" type. In Fig. 2 the same circuit is adapted to the panel type switch having two blades insulated from one another and extending the same distance to either side of the knob. Of the three methods mentioned, the first is best if the apparatus is laid out on a board for experimental use, and the others are designed for panel mounting and work out nicely with the cabinet type receiving set. The inductance marked "Pri" in the accompanying sketches may be either the primary of a three-circuit tuner or the antenna coil of

a single-circuit tuner. In cases where it is desired to receive wave-lengths below the fundamental or free oscillating wave of the aerial plus the addition to the wave by reason of having added some inductance, the series connection should be used. A series condenser *reduces* the wave-length of the antenna circuit to a value lower than it would tune if it were not in the circuit.



The other position of the switch places the condenser across the primary coil, where the wave-length is *increased* above that obtainable without it. In cases where the receiving antenna is very short and it is desired to receive especially long waves, more than obtainable by adding all the inductance in the primary circuit of the tuner, the shunt connection is the one to use. With honeycomb coils such a switching arrangement is almost a necessity and with a receiver having only a rough variation of the antenna inductance (a single switch) it will enable much closer tuning to be effected.

Sending With the Receiver

It has been quite popular of late to handle local traffic during the early evening by simply using the receiver with the tube oscillating and a telegraph key in the ground. This gives a surprisingly sharp C.W. signal that carries all over town and should not cause the slightest interference with broadcast receiving next door. Using an amplifier tube and several score volts on the plate results in louder signals and greater distance. Beautiful "break-in" can be worked by two stations adjusting their receivers so they heterodyne each other.

One thing must be remembered, however. The radio law of the United States does not say one can transmit on any old wave length and without a license. Legal transmission is carried on with a license, using a licensed call, and operating on 200 meters or below. Getting up in the neighborhood of 400 meters and operating with initials for a call is not according to Hoyle. It may be true that such work will cause no one any direct harm, but little slackness of this kind damage our general morale.

We are today about as near to complete observance of the radio laws as any group in radio; let's keep right on occupying that position. We hope therefore that this little article will not have the same effect as was the case in the old story where a mother went down town and the last thing cautioned her children not to put beans in their ears, which was something they had never thought of before.

Radio Makes Flying Safer

A modern airplane is fairly safe as long as the pilot can see the ground but when this becomes obscure because of darkness or fog, the situation becomes a dangerous one. Location is unknown but the radio compass does much to eliminate this hazard. To know the altitude above the landing field, the flyer must depend on the altimeter under these conditions. An altimeter is nothing more nor less than an aneroid barometer with a scale in altitude, and like any other barometer it changes not only with altitude but with weather as well and gets these two things inextricably mixed. A change in weather may change its reading by an amount corresponding to a hundred feet or more in altitude—a serious error in a fog.

A new altimeter developed by the Bureau of Standards has the usual fixed scale and it has also a movable scale the zero of which can be set at any point on the fixed scale. In approaching the landing field the operator gets the barometer reading at the field by radio and sets the zero of his movable scale to that reading on the fixed scale. His altitude will then tell him accurately how high he is above the landing field and will enable him to get down safely in a fairly thick fog. When airplanes become more common it will not be necessary for pilots to have transmitters on the planes as the barometer readings will be broadcasted regularly along with the weather and compass transmissions from the ground.

A. A. HEBERT

(Concluded from page 60)

vices to amateur radio for which we are indebted to him in no small measure. He is a charter member of the Institute of Radio Engineers, a member of the Board of Directors of the Radio Club of America, president of the Nutley (N. J.) Radio Club, and president of the Second District Executive Radio Council. The latter responsibility was acquired in the recent Council reorganization and Mr. Hebert now has the difficult task of guiding the destinies of one of the largest and most powerful bodies of amateur radio men.

But in spite of these responsibilities Mr. Hebert manages thoroly to enjoy his radio and says "There is nothing like it to keep a man young—it is superior even to golf."

Strays



QST has great pleasure in announcing the acquisition on its staff of Mr. S. Kruse, as Technical Editor. Mr. Kruse, or "LQ" as his personal sine goes, is so well known to most A.R.R.L. members that introduction is needless. Hailing from Lawrence, Kansas, real old-timers will remember him as pre-war 9LQ; newer friends know him as 3ABI of Washington, where he resided for several years as an assistant physicist in the radio laboratory of the Bureau of Standards. From there he joined the research staff of John Hays Hammond at Gloucester, Mass., and did field experimental work in Mexico and the Gulf during the past year. He is a member of the A.R.R.L. Board of Direction and of its Advisory Technical Committee, author of many papers in QST, and representative of the best in Amateur Radio. His connection on our staff is assurance of a better and more interesting QST.

Mr. J. Kenneth Bolles has also joined the A.R.R.L. headquarters personnel as Publicity Manager. Mr. Bolles is a journalist of many years experience and comes to us from the *Hartford Courant* where he has been doing special work. For some time past the League has been in need of a special department to take care of the dissemination of amateur news to the general public. Mr. Bolles arrives just at the beginning of the Transatlantic Tests and there is every indication that he will have to use a steam shovel to dish out the news as fast as it is created this month.

Station DN4 has been closed up indefinitely because of interference, we are told. It is alleged in one instance that 600 meter Naval traffic on the Pacific coast was held up for 45 minutes, not to mention interference with amateur communication.

The price of the government call book "Amateur Radio Stations of the U. S.", has been increased from fifteen cents to twenty-five cents per copy.

Ex-spark enthusiasts can easily use their old spark transformers for C.W. with some changes. For example, with the old Packard transformers so popular before the

war, two or three 1500-turn honeycomb coils can be slipped on in place of the old secondary and will deliver about 600 volts each, with excellent cooling and without changing the primary winding in any way. Or if this same transformer is desired for filament excitation, wind on 24 turns of No. 14 wire to supply two fifty watt tubes. This may be easily done by threading the wire thru the core without taking it apart. At 1HX a two ampere General Radio rheostat is used in the *primary*, which together with the primary taps, furnishes complete filament control from five to eighteen volts. With a transformer about which nothing is known as to primary turns, thread thru a couple dozen turns or so and measure the voltage on load. Divide this voltage by the number of turns to find the voltage per turn, which is the same for any coil put on the core, and by following Babcock's dope printed last month, any spark transformer can be renovated to make a perfectly good C.W. transformer.

Wud U Believe It?

1KX caught a squirrel trying to get into his cage.

8LX has a trained cricket that chirps "CQ".

8EW has a dorg that bawkes "Hi, Hi."

8BRL has a rooster who crows "Q" but we don't know why.

8LF has a phord that can rattle off the whole alphabet in a hundred feet or less, but the alphabet isn't the only thing it rattles off.

It appears that if canary birds could be taught to whistle the code they could be rented out to B.C.L.'s who want to become amateurs. Maybe a parrot would be a good auxiliary to interpret the code.

A sweet young thing called 8BRL on the phone and asked if he would help her with her station whose call letters were FADA. Needless to say he kindly consented and found a single slide tuner, a pair of mud hooks, and a crystal detector bearing the trade name "FADA." Herb is trying to figure out why a crystal detector rates call letters.

Read 'Em and Weep.

2AWL on four fifties has been heard in all states but four, England, France, Switzerland, and Honolulu.

6ZX, Walnut Grove, Calif., heard and complete msg copied at Apia, Samoa, DX 4,230 miles on four five watters.

8BEO on the same power has been reported from Hawaii, 6ZZ, 6IV, 6AMI, 6XAD, 7AGF and England.

9ZAF, Denver, Colo., (see description this month) has been reported in Apia, Samoa, which is about 1500 miles more distant than England.

6ACB and 8BEX have been heard across the continent on five watts, and 9BVP has been heard in 28 states on the same power.

6KA, 6XAD, 7ZO, 7ZU, 6ASJ, 6BES, 6ZM, and many others from the west coast are regularly heard up and down the Atlantic coast. Ditto 1XM, 8BFM, 8BK, 8BEO, 8BKE, etc., on the west coast. (See also the lists of 6ZAC and 6ZY in the *Calls Heard Department* this month.)

Dere Eddy: A fellow came in today and wanted to buy a 1 K.W. spark transmitter complete. After I came to, I went and got a shovel and dug it up from the dust. Then he asked me what distance he could expect from a test buzzer. Mygawdwatin-ellnext?—L. P.

Mr. E. C. Adams, our Advertising Mgr., is now the proud daddy of a fine little daughter. QST may never be out on time again! Subscribers who smoke may clip out the cigar coupon from page 152 and mail it to Ed Adams.

For our newcomers who are trying to learn the code but are hushed up when the buzzer starts for fear of waking the baby, it has been suggested that the crystal detector be carefully adjusted, one of the switches run off the contacts, and the key or omnigraph connected in the antenna lead of the receiver.

3XM and 3DH are back again, owned and operated by the Princeton University Radio Club, Princeton, N. J.

There is a statement often quoted around Chicago stockyards that in the modern abattoirs all of a pig is used but the squeal. Science has evidently progressed to the point where even this has been saved, and now seems to be supplied as an accompaniment to concerts.

9CA wishes fewer sets were installed in the nursery as judging by some sending the gang must sit on rocking horses.

8AOT needs shielded amplifying transformers as the mice have eaten the coils in several transformers. He swears it isn't a radio bug either.

Concerning Funny Routings

"J" of 3XM suggests that we start a department for bonehead plays in QST and razz the fellows that route msgs from Dallas to San Francisco, via Kansas City and Princeton, N. J. Honestly we would love to have the gang help us razz a few of the funny and stupid things that happen if it could be done in absolute good spirit and without malice.

But we wonder if the funny routings are really always as crazy as they seem. It may seem idiotic to a Chicago man when he is passed a message from Lawrence, Kansas, for delivery to St. Louis but the sober fact is that there is no better routing—it cannot be done direct. It surer than heck is that way in New England. Msgs to New York from Boston are sent in all sorts of wierd ways. And in the 3rd district it used to be the same way—the best possible method of getting traffic from Washington to Baltimore (40 miles) was to give it to 9ZN many miles west. In the days of spark Washington and Baltimore never hooked up direct but both were QSO 9ZN, 8BO, and 8ER quite regularly. Wonder if the same thing is not true in the Rockies. How about it? 6's, 7's, 5's and 9's now have the floor.

Wow! We spoke about the government getting short of calls and assigning half calls, but there seems to be a further shortage. 5AAR didn't like his call because when he signed off with 5AAR K everyone wondered if it was 5A or what so he went after a "Special" and—zowie—drew the call 5ZADA. He is afraid he will get a worse one if he tries again (5ZUKEM or 5ZCBXQ) so is making the best of it. If you hear him struggling thru this hypocrondicial call, get the per and drop Zeigler a card.

Furthermore the call shortage is world wide. In Holland the government had none to give the amateurs so they manufactured their own using the prefix "O" (zero). But that is nothing, up in Canada calls are assigned starting with "10" (ten). 'Spouse we will be dishd out negative calls next with a minus sign in front of the numeral.

According to a newspaper clipping, Texas amateurs use no aerals but simply hook onto a door knob. Upon further investigation "Rip" tells us that down Texas way they just put a crystal in their ear and stand near an open window and, say, the DX stuff comes in great!—Next.

Awrf!

The CQ formula for the Southern Minnesota Radio Assn. is, 3 (3CQ + 3 signs) + CQ + sign = CQ. Example: CQ CQ CQ de 9AWM 9AWM 9AWM three times and then CQ de 9AWM.—Q.E.D.

Calls Heard



HEARD DURING NOVEMBER Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls "double spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of an 8½" x 11" sheet.

(2) Arrange alphabetically thru each district, from 1 to 9, and then Canada, with no break between the districts, using commas to separate calls and parentheses around calls of stations also worked—as in examples below.

(3) The period covered by the report shall be so stated and shall be approximately from the first of one month to the first of the following month. All lists must be received by us the 8th of the following month for publication in the next QST.

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner and then make a second paragraph in identical form listing the C.W. stations. Commercial calls will not be published.

Now that everybody knows how to do it, let's have a better grade of lists with some real DX and fewer nearby calls. However, be absolutely sure of the calls you log and report.

H. A. Cookson, S. S. China. (1 step)
October 27th. In addition to those reported last month the following have been heard in Honolulu Harbor: 9YFT, 9GK, Canadian 9AL in Toronto, 9AWM, 8AWP in Syracuse, N. Y., and 8AQO, Cazenovia, N. Y., tho 5100 miles distant, rolled in like a ton of bricks and every word sent was copied clear as a bell. Only calls more than 4500 miles distant reported in this list. [Hot dog! Wish every list had such DX—Ed.]

5XAD, 5QY, WEG, SS Trinidadian 100-150 miles S. S. W. Burwood, La.

Sunday Dec. 10, 1922—8:43 A.M.—4:15 P.M.: 5XV, 9BCF, 5DI, 5KC, 9KP?, 5YG, 9ANZ, 4IZ, 5MY, 5VY (calling 5JI by voice 10:42 A.M.), 1AJP working 3FS, 9FM "Hv dalite schedule wi Hutchinson", 9AWM 3:50 P.M. "can't get them on fone, wI call them tonite", 3BVL, 2AVU, 3MB, 3BOF. Several other 5s and 9s hrd but not logged. Detector and 1step used. Sig.—Gray & Gray, Orange, Texas.

Harold T. Mapes, Guanajuato, Gto., Mex
(All over 600 miles away. Two tubes.)

C.W.: 4CG, 4HW, 5AAR, 5ACE, 5AEC, 5AFO, 5DA, 5EK, 5EN, 5IR, 5JB, 5KP, 5LA, 5MY, 5MO, 5NK, 5NO, 5PO, 5QY, 5SM, 5TC, 5TJ, 5UD, 5UJ, 5UK, 5VO, 5VA, 5XB, 5XA, 5XD, 5XAD, 5ZS, 5ZAV, 5ZB, 5JM, 6AH, 6APW, 6AKL, 6AGP, 6ALU, 6BV, 6BEQ, 6CC, 6FN, 6IV, 6NY, 6XWI, 6ZZ, 6ZF, 6ZH, 6ZA, 6ZO, 6ZB, 6BUM, 8ATU, 8AMM, 8XE, 8AB, 8FT, 8QK, 9AMI, 9ASF, 9AWN, 9AWM, 9AVL, 9AQR, 9AWS, 9ANQ, 9BJI, 9BED, 9BJU, 9BEY, 9BKW, 9BDS, 9BZI, 9BIK, 9CFY, 9CCU,

9CCV, 9DQM, 9DKY, 9FM, 9GK, 9PI, 9PN, 9XAK, 9YAJ, 9ZAA.

Canadian 3JE, Toronto, Can.

C.W.: 1AW, 1BS, 1FW, 1GV, (1II), 1RD, 1XM, 1XU, 1ZE, 1ZX, 1AKG, (1AWB), 1AYQ, 1AZL, (1BDI), 1BET, 1BKQ, 1BWJ, (1BOM), 1BRQ, (1BYN), 1CAZ, 1CBY, 1CJH, (1CMK), 1CNF, (1CRQ), 1CXX, 2GR, 2KF, 2NZ, 2TS, 2UD, 2WB, 2XX, 2AFB, 2AGK, 2AHO, 2AJA, 2AJW, 2ASF, 2AWL, 2AYZ, (2AYV), 2BGI, (2BBB), 2BGM, 2BMS, 2BQE, 2BRB, 2CBV, 2CBW, 2CPW, 2CKN, 2CKR, 2CQZ, 2XAD, 3BA, 3BG, 3BX, 3BZ, 3CC, 3CG, (3CM), 3CP, 3FS, 3GF, 3HD, (3HG), 3HL, 3IW, 3JJ, 3LP, 3LR, 3NH, 3OT, 3SM, (3QV), 3TJ, 3XM, 3YO, (3ZS), (3ZO), 3AFB, (3AHP), 3AJH, 3AJJ, 3ANJ, 3ANS, 3AQR, 3ASP, 3AUU, 3AVW, 3ATZ, 3AWE, 3BNU, (3BHM), (3BLF), 3BIJ, 3BVA, 3BUM, 3BVC, 3BUP, 3CGN, 4BK, 4BX, 4BY, 4EL, 4DA, 4DL, 4GH, 4GL, 4ID, 4JM, 4JY, 5DA, 5DO, 5DJ, 5EK, 5ER, 5FV, 5QV, 6XA, 5AAG, 5ZAV, 6BSA, 6KA, 6XAD. Eighty two numerous, the following worked: 8HH, 8HN, 8IQ, 9KG, 8LS, 8ON, 8QB, 8SB, 8VY, 8ZD, 8AFL, 8AGO, 8AIH, 8AIL, 8ASV, 8AU (QRA, ?) 8AVD, 8AXN, 8AZF, 8BNY, 8CRC, 8CCS, 8CFP, 8CGU, 8CGV, 8CGX, 8CKM, 8CKO, 8CPX, 8BP, 9CP, 9CR, 9EI, (9GK), 9II, 9LZ, 9MC, 9NU, 9OX, 9UC, 9UU, 9ZV, (9ZL), 9AAP, 9AFD, 9AFK, 9AHH, 9AIY, 9AJP, 9AMI, 9AMK, 9ANQ, 9AQZ, 9AVA, (9ATN), (9AUL), 9AOG, 9AOJ, 9AON, 9APW, (9AOU), (9ACT), (9APS), 9AQM, 9AWL, 8AWM, 9AWS, (9BCT), (9BDS), 9BED, 9BES, 9BFG, 9BHD, 9BIE, (9BIK), 9BJT, 9BJV, 9BKJ, 9BLT, 9BLY, 9BWF, (9BQW), (9BVL), 9BXL, (9BZI), 9CEE, 9CUC, (9CTE), 9CK, (9CTR), (9DBL), 9DFB, (9DJM), (9DGE), 9DGQ, 9DRB, (9DGN), 9DYN, 9DKY, 9IY, 9XAC, 9YAJ.

Daylight: 1BDI, 1AZL, 1ZE, 1ZX, 1CJH, 2BBB, 2BIS, 2CNF, 8KP, 8NB, 8UE, 8SB, 8UF, 8QC, (8KU), (8AIL), (8AXN), (8AU), 8ASV, 8BXX, 8BEO, 8BXA, 8CUU, 8CUR, (8CFF), 8CAN, 8XAC, 8IW, 9AYS.

Canadian 4DQ, Vulcan, Alberta, Canada.

C.W.: 1AZW, 1BDI, 1BNT, 1BWJ, 1CY, 1CDO, 1CNF, 1XM, 2AGC, 2AWL, 2AXK, 2BQU, 2CCD, 2CP, 2GK, 2LO, 2XQ, 2UD, 2WB, 2ZG, 3AFB, 3AGC, 3APD, 3BFU, 3BIJ, 3BNU, 3GK, 4BV, 4DK, 4EH, 4FG, 4FT, 4ID, 4TM, 5ACF, 5BN, 5EK, 5MO, 5NK, 5PX, 5RH, 5SK, 5TJ, 5VY, 5XT, 5ZA, 5ZS, 6ABX, 6ALU, (6AOI), 6ARB, 6ARF, 6ATQ, 6BCL, 6BJQ, 6BMD, 6BOE, 6BOO, 6BQC, 6BUM, 6BVG, 6CC, 6DD, 6EC, 6GR, 6GX, 6IV, 6KU, 6LX, 6NX, 6TC, 6TI, 6UW, 6VM, 6ZH, 6ZI, 6ZU, 6ZZ, 7ABB, 7ABY, (7ADF), (7ADP), (7AEM), 7AFS, 7AFW, (7AGF), 7AIC, 7ALX, 7AW, (7BJJ), 7BK, 7DC, (7DP), 7DU, 7EK, (7EQ), (7HM), (7KE), 7KG, (7LU), 7LY, 7MF, 7NN, 7NY, 7PF, (7QT), (7RI), 7RN, 7SC, 7SY, 7TH, 7TU, 7TW, (7TQ), 7WM, 7WW, 7WX, 7ZU, 7ZV, 8AZD, 8BEF, 8RFM, 8BTR, 8BYT, 8BWA, 8DAT, 9AAP, 9AC, 9ABB, 9AEN, 9AFD, 9AHH, 9AJP, 9AMB, 9AMI, 9AOP, 9APR, 9AOU, 9APW, 9ASE, 9ASF, 9ATN, 9AUA, 9AUL, 9AWM, 9AXU, 9AYS, 9HAY, 9BBF, 9BFC, 9BED, 9BEY, 9BFG, 9BJI, 9BJR, 9BJV, 9BGH, 9BIK, 9BKW, 9BLT, 9BRI, 9BSZ, 9BUD, 9BVL, 9BVO, 9BXA, 9BXT, 9BXQ, 9BZI, 9CHA, 9CEH, 9CFI, 9CCV, 9CFY, 9CGK, 9CHN, 9CMK, 9CXP, 9DKY, 9DPF, 9DQM, 9DTE, 9DYG, 9DZW, 9DGE, 9EBT, 9FM, 9HM, 9IG, 9NU, 9PW, 9QF, 9UH, 9VU, 9ZAF, 9ZN, fone 6ZA, 6ZX, 6XB, 7ZU, 9EBT, C.W. (BT3). Canadians: 3BV, 4AQ, (4BR), (4BV), 4DK, 5CN, (5CT), 5BQ, fone 4BV.

Spark: 6ACR, 6AO, 6BIP, 6FH, 6QR, 7AFN, 7AW, 7KJ, 7LY, 7TW, 7UR, 7WG, 9AUU, 9AQE, 9CTW, 9FX, 9PN, 9XT, 9ZX, Canadian 4FW.

Canadian 5CX, Prince Rupert, B. C.

C.W.: 51S, 5TJ, 5ZA, 5AEC, 6QR, 6QY, 6UW, 6VA, 6VM, 6VW, 6ZI, 6ZO, 6ZR, 6ZX, 6ZZ, 6ABX, 6AOL, 6ARB, 6AZF, 6BGC, 6BIQ, 6BUM, 6BNK, 6BVN, 7AM, 7BC, 7BJ, 7BK, 7BQ, 7EB, 7GP, 7HZ, 7JW, 7KE, 7LU, 7MF, 7NN, 7NY, 7OE, 7OT, 7PF, 7QE, 7QN, 7RI, 7SC, 7SG, 7TQ, 7UD, 7WM, 7ABB, 7ADE, 7AEK, 7AFS, 7AIC, 7BKM, 8AB, 8BK, 8VM, 8ZY, 8AZF, 8BIQ, 8BP, 8CP, 8DG, 8GK, 9II, 9VV, 9YI, 9ZT, 9AIX, 9AMI, 9ANQ, 9APW, 9ATN, 9AVL, 9AVZ, 9AWM, 9AWT, 9BBF, 9BCF, 9BEY, 9BIK, 9BJV, 9BQW, 9BZI, 9CCV, 9GSF.

Spark: 5CN, 7HD, 7KJ, 7TM.

Canadians: 4AB, 4BT, 5BQ, 5CK, 5CN, 5CT, 5DI, 9AC, (all C.W.)

1AW, Hartford, Conn. (All C.W.)

1ARY, 1BAS, (1BIY), (1BHW), (1CMK), 1BRQ, 1CFN, 1BRH, (1QP), (1BOM), (1BKQ), 1AHZ, 1AGK, 1CGO, 1PR, (1XM), 1XP, 1BDI, 1XU, (1BGF), (1ZE), 1OK, (1ON), 1BWJ, (1BET), (1BWF), (1AJU), 1II, 1BEP, 1GV, 1ASF, 1FM, 1BZF, (1IL), 1BAG, 1RU, 1RD, 1BEA, 1MD, 1CCZ, 1BYN, 1CQZ, 1AZW, 2AAB, 2AGK, (2OM), 2XAP, 2KW, 2XQ, 2UD, 2BEA, 2LO, 2ZL, (2FP), 2BGM, (2BML), 2CKL, 2GK, 2AYV, 2CQZ, 2CCD, 2BUM, 2RZ, 2EL, 2CMG, 2ZK, 2APA, 2HJ, 2NZ, 2TO, 2AWF, (2AWL), 2BQD, 2AVO, 2AFP, (2BRB), 2BFX, 2CMS, 2RM, (2RY), 2ABD, 2CNZ, 2AXK, 2KF, 2CBW, 2BBB, 2AWS, (2WB), (2AJF), (3AUW), (3CN), (3ANJ), (3ZO), 3ARO, 3FS, (3BHM), 3ZW, 3BVC, (3JH), 3CG, 3BG, 3GR, (3JJ), 3AFB, 3QV, 3HX, 3BZ, 3LT, (3RW), 3CC, 3APD, 3APR, 3IW, 3BV, 3BIT, 3RF, 3BIY, (3BNU), 3GN, (3XM), 3BAR, 3AJD, 3WF, 3OT, 3BA, 3BLF, 3ATG, (3AGN), 3BJI, (3HG), 3BVA, 3BX, 3BQX, 4DL, 4YA, 4NT, 4IV, 4GH, 4BX, 4DL, 4ID, 4DC, 4EA, 4BY, 4KM, 4HW, (4LJ), 4IV, 5EK, 5XA, 5ZA, 5SK, 5KK, 5FV, 5ER, 5AA, 5GD, 5AAG, 5QY, 5EJ, 5XAD, 5ZAS, 5EA, 5ZAV, 6XAD, 6KA, 7ZO, 8ZW, 8XE, 8BNJ, 8YD, (8AWP), (8BO), 8CEI, 8CJH, 8QI, 8BCY, 8AXC, (8AQO), 8CGX, 8AWZ, 8ZZ, 8AMQ, 8IB, 8BXH, 8WR, 8QK, 8CFP, 8ASK, 8FM, (8NB), 8ASV, 8BXK, 8AM, 8FJ, (8ADG), (8ZY), 8CWP, 8AAB, 8EO, 8BJV, 8BFM, 8CJX, 8BVT, (8CSE), 8CNW, 8AFG, 8ZAE, 8BFI, 8CTF, 8BJC, 8DR, 8BAH, 8AIO, 8CBC, 8BUM, 8CGU, 8BZY, 8BJX, 8ML, 8ALC, 8AAF, 8SB, 8ZD, 8AKP, 8ACF, 8APT, 8SB, 8BZY, 8CEN, (8QM), (8CUR), (8BXK), 8CNW, 8SB, (8HH), 8ARB, 8AIM, 8PD, 8UK, 8XH, (8ATU), 8BEF, 8CF, 8QK, 8OW, 8BPL, 8BVR, 8IQ, 8ZX, 8CJY, 8BMM, 8BFH, 8LT, 8CYT, 8BRL, 8ZAF, 8AGO, 8VY, 8CTN, 8BU, 8JQ, (9ZN), 9ZAA, 9APS, 9CP, 9YAJ, 9DYN, 9IO, 9UO, 9BSL, 9CP, 9LZ, 9EI, 9PI, 9BED, 9UC, 9XM, 9AAP, 9GL, (9II), 9QR, (9AWM), 9BRK, 9GK, 9DWK, 9AKD, 9CKK, 9DKY, 9BDS, 9AMI, 9YAJ, 9PI, 9VK, 9BVL, 9DP, 9AYW, 9BCT, 9EBI, 9BCB, 9IY, 9AIX, 9DOZ, 9OX, 9CPY, 9CBA, 9FM, 9AFN, (9CTE), 9BRO, 9BCF, 9XL, 9CR, Canadians: 9AL, 9BH, 9BS, 3BP, 3DH, (3DS), 3KO, 2BG, (2AM), 9AW, 3CO, 3CN, 3JK, 3CP, 3JE, 4BV.

1TS, Bristol, Conn. (1 tube, 44 states)

Spark: 8ABL, 8ACF, 8AD, 8AEO, 8AFG, 8AIB, 8AJT, 8AOL, 8APA, 8AWP, 8AWU, 8AXN, 8AXQ, 8AXZ, 8AH, 8RGO, 8BDA, 8BEP, 8BFV, 8BGT, 8BM, 8BOV, 8BPG, 8BXC, 8BYP, 8CDI, 8CEB, 8CER, 8CKV, 8COA, 8CVH, 8CYU, 8EO, 8EU, 8EV, 8IN, 8JQ, 8KU, 8KY, 8LH, 8MZ, 8OI, 8PU, 8RQ, 8TC, 8TJ, 8UC, 8VQ, 8VW, 8YN, 8YU, 8AAW, 8AC, 8ACB, 8AFK, 8AIR, 8AIU, 8AMK, 8AMQ, 8AOJ, 8APV, 8AZA, 8AZE, 8BOO, 8BQ, 8BTX, 8BWS, 8BXC, 8CA, 8CDZ, 8CP, 8CW, 8DAG, 8DHG, 8DHZ, 8DPE, 8DFJ, 8DWA, 8DXH, 8DXT, 8JN, 8JX, 8KI, 8LF, 8MG, 8OF, 8ON, 8OR, 8PN, 8TV, 8VZ, 8XF, 8YAK, 8ZC, 8ZN, 8ZV, Canadians: 3BF, 3FO, 3GE, 3GN, 3RO.

C.W.: 4BK, 4BQ, 4BX, 4BY, 4CG, 4DC, 4DL, 4EA, 4EB, 4EH, 4EN, 4FG, 4FT, 4GH, 4GL, 4HW, 4ID, 4JK, 4JM, 4KC, 4KL, 4KM, 4NT, 4YA, 5ADE, 5AEC, 5DA, 5DI, 5EK, 5ER, 5ES, 5FV, 5GB, 5HK, 5HL, 5IK, 5IR, 5JB, 5MB, 5MO, 5MY, 5NN, 5PV, 5PX, 5QY, 5SK, 5SM, 5SU, 5TJ, 5UN, 5XA, 5XAD, 5XK, 5XR, 5XT, 5XV, 5ZA, 5ZAA, 5ZAS, 5ZAV, 5ZB, 5ZS, 5ZY, 6BBH, 6BCR, 6KA, 6XAD, 6KH, 6ZH, 6ZO, 6ZZ, 7NY, 7ZO, 7ZU, (voice), 7ZV, 9AAP, 9AAV, 9ACE, 9ACY, 9AEP, 9AEY, 9AFD, 9AFK, 9AFN, 9AFT, 9AHH, 9AIP, 9AIU, 9AIX, 9AIY, 9AJD,

9AJP, 9ALP, 9ALW, 9AMB, 9AMH, 9AMI, 9AMK, 9AMU, 9ANF (voice), 9ANI, 9ANQ, 9AOG, 9AON, 9AOT, 9AOU, 9AP, 9APN, 9APS, 9APW, 9AQM, 9AQZ, 9AR, 9ARU, 9ARZ, 9ASE, 9ASF, 9ATE, 9ATI, 9ATN, 9ATX, 9ATZ, 9AVZ, 9AWF, 9AWM, 9AWS, 9AWZ, 9AYS, 9BB, 9BBF, 9BCB, 9BCH, 9BCT, 9BDB, 9BDS, 9BED, 9BEY, 9BFQ, 9BGH, 9BIE, 9BIG, 9BIJ, 9BIK, 9BIL, 9BIZ, 9BJI, 9BJT, 9BJV, 9BLG, 9BLO, 9BLT, 8BOG, 9BP, 9BPS, 9BQW, 9BRK, 9BSP, 9BVP, 9BVZ, 9BWS, 9BXC, 9BXL, 9BYA, 9BZI, 9BZN, 9CAH, 9CBA, 9CCM, 9CDB, 9CEB, 9CEH, 9CFK, 9CGD, 9CGK, 9CGN, 9CIT, 9CIY, 9CJA, 9CJC, 9CLN, 9CNE, 9CNS, 9CTA, 9CTR, 9CP, 9CPY, 9CR, 9CTB, 9CTE, 9CVO, 9CXP, 9CZY, 9DBL, 9DCT, 9DDY, 9DFB, 9DGE, 9DGO, 9DHz, 9DIB, 9DJM, 9DKY, 9DMJ, 9DNH, 9DOK, 9DPF, 9DPJ, 9DQU, 9DR, 9DRR, 9DTE, 9DYN, 9DXT, 9DYN, 9DZY, 9EBH, 9ECI, 9ECR, 9EJ, 9FM, 9FW, 9GK, 9GL, 9HM, 9II, 9IL, 9IO, 9KP, 9LH, 9LQ, 9LZ, 9OF, 9OX, 9PF, 9PI, 9PQ, 9QU, 9SJ, 9UC, 9UF, 9US, 9UU, 9VK, 9VZ, 9WA, 9WX, 9XAC, 9XAK, 9XL, 9YAJ, 9YB, 9YF, 9YM, 9YW, 9ZAA, 9ZAF, 9ZL, 9ZN, 9ZT.

Canadian: 2AM, 2AN, 2AZ, 2BG, 2DN, 2EI, 2HG, 3ACJ, 3AQ, 3BV, 3CO, 3CZ, 3DE, 3DH, 3DS, 3EI, 3FC, 3GE, 3GK, 3JE, 3JH, 3JI, 3JK, 3KO, 3KP, 3NB, 3OE, 3PB, 3SI, 3SX, 3TA, 4BE, 4BV, 9AJ, 9AL, 9AW, 9BV, 9EI.

1CMK, Holyoke, Mass.

C.W.: 4BK, 4BQ, (4BX), (4CG), 4CO, 4CY, 4DL, 4DQ, (4EB), 4EH, (4FT), (4GE), 4GL, 4GT, 4HI, (4HW), 4IV, 4JK, 4JL, 4JM, 4KK, 4LJ, 4MN, (4NT), 4BSB, 4YA, 5BN, 5DA, (5DI), 5DO, 5EG, (5EK), 5EL, 5ER, (5FV), 5HL, 5HY, 5IR, (5JB), 5KC, 5MO, 5MY, 5NB, 5NN, 5NV, 5PB, (5PX), 5QI, 5QY, 5SF, 5SK, 5SM, (5TC), (5TJ), (5UK), 5UO, 5VA, 5AAG, 5ADE, 5XA, 5XK, 5XT, 5XV, 5XY, 5ZA, 5ZB, 5XAD, 5XAE, 5ZAB, 5ZAP, 5ZAS, 5ZAV, 6CC, 6KA, 6PD, 6BBH, 6BSA, 6ZH, 6ZZ, 6XAD, 7SC, (7ZO), (8AA), (8BO), 8HH, (8HN), (8IJ), 8JQ, (8KU), 8LS, (8NB), (8OE), 8OM, 8ON, 8OW, 8QC, (8QK), (8SB), (8SP), 8SZ, (8UK), (8UR), (8VQ), (8VY), 8ABX, (8ACH), 8ADZ, 8AER, (8AFM), (8AGO), (8AHK), 8AHR, (8AIIH), (8AIW), 8ALF, (8AMM), 8AMR, (8ANE), (8ANN), 8APE, (8ASK), (8AWT), 8AWZ, (8AXC), 8AXX, (8AZD), 8AZF, 8BDO, (8BDV), 8BEP, 8BFR, 8BFX, (8BHO), (8BJV), (8BKE), (8BMK), (8BMM), (8BNU), (8BNT), 8BOA, 8BOW, (8BPN), 8BRC, 8BRM, 8BSY, (8BTL), 8BTR, 8BUT, 8BVR, 8BVT, (8BWA), (8BWK), (8BYF), 8CBC, (8CBX), 8CCR, 8CEI, 8CGM, 8CGN, (8CGQ), (8CGU), 8CIA, 8CIM, (8CIX), (8CJH), 8CJS, 8CKN, (8CKO), (8CMI), 8CMY, 8CNW, 8COI, 8CPX, 8CQO, 8CQY, 8CRB, (8CTP), (8CUM), (8CUR), (8CUS), (8CUU), (8CYT), 8CYV, 8CZC, 8CZZ, 8DAA, (8DAE), 8DAT, (8XE), (8YN), 8YU, (8ZZ), 8XAU, 9AP, 9AR, 9BP, 9CG, 9CP, 9CR, 9DV, (9EI), 9EJ, 9GF, 9GK, 9GL, 9HM, (9II), 9IY, 9KM, (9LE), 9LH, 9LQ, 9LZ, 8OX, 9PF, 9PI, 9PN, 9PS, (9PW), (9QF), 9UG, (9US), (9UU), 9VK, (9VZ), 9WC, 9WX, 9AAG, (9AAP), (9AAV), 9AAW, 9ABU, 9ACE, 9AFD, 9AFK, 9AHH, 9AIP, (9AIU), (9AIX), (9AIY), 9AJF, 9AJP, 9AKD, 9AKU, 9AMH, 9AMI, 9AMO, 9AMT, 9AMU, 9ANF, 9ANQ, 9AOG, (9AON), 9AOT, (9AOU), (9APS), (9APW), 9APZ, 9AQM, (9AQZ), 9ARG, 9ARK, (9ARZ), (9ASE), (9ASN), 9ATN, 9ATZ, (9AUA), (9AUL), 9AVM, (9AVZ), (9AWM), (9AWS), (9AXA), (9AXU), (9AYH), (9AYS), 9BAH, 9BAK, 9BCH, 9BCT, (9BDS), (9BED), (9BFG), 9BHD, 9BIA, (9BIE), (9BIJ), (9BIK), 9BIL, 9BII, 9BJR, 9BJT, 9BJV, (9BKJ), (9BLC), (9BLG), 9BLT, 9BLY, 9BNO, 9BQY, 9BRK, 9BRL, 9BRO, (9BTA), 9BVL, (9BVP), (9BWF), 9BWS, 9BZI, (9BZN), 9CAH, (9CBA), 9CBS, 9CCM, 9CCS, 9CCV, 9CEE, 9CEH, 9CFK, (9CGK), 9CGN, (9CHN), (9CIP), (9CIY), 9CJA, 9CJC, 9CLZ, 9CMK, 9CNF, (9CNS), 9CNV, 9CPE, 9CQM, (9CTE), (9CTR), 9CUC, 9CVI, (9CVO), 9CWO, 9CXP, 9CXV, (9DBL), 9DBV, 9DCF, (9DCT), 9DDY, (9DFB), 9DGE, (9DGO), (9DJB), (9DJO), (9DKY), 9DNH, 9DOF, 9DPL, 9DQU, 9DST, 9DSM, 9DSW, (9DSX), (9DUG), 9DYN, (9DVW), 9DWM, 9DWQ, 9DWW, 9DXN, 9DXT, 9DYN, 9DYY, 9EBH, 9EBI, 9ECE, 9XL, 9YB, 9YM, (9YU), (9ZL), 9ZN, 9XAC, 9XAK, (9YAJ), 9ZAA, 9ZAF.

Spark: (9HO), (9XT), (9ZN).

9CP, 9EI, 9EJ, 9II, 9LQ, 9PN, 9PS, 9ZN, 9AAP, 9AFK, 9AHH, 9AMI, 9AOU, 9AQN, 9AUL, 9BDS, 9BEY, 9BTT, 9BZL, 9DFB, 9DKY, 9DQU, 9DWQ, 9DYN, 9ZEI.

4MY, 4 East 13th Street, Atlanta, Ga.

All Spark: 1BQ, 1CJA, 1CNI, 2FP, 2GV, 2NS, (2OM), 2WB, 2AJE, 3JK, 3OT, 3SU, 3ZM, 3ACY, 3AHE, 3AOV, 3ARN, 3AWF, 3BVC, 3CCB, 4FB, 4FD, 4GN, 4SK, 4EL, 5AE, 5AL, 5AO, 5AQ, 5BK, 5DA, 5DG, 5DO, 5EK, 5FP, 5FV, 5GD, (5GK), 5IO, 5IR, 5IS, 5JB, (5JF), 5JI, 5JL, 5KM, 5LB, 5MD, 5MX, 5NC, 5OI, 5OW, 5OZ, 5PE, 5PP, 5QQ, 5QS, 5QY, 5RO, 5RZ, 5ST, 5TL, 5TP, (5TU), 5UC, 5UD, 5UE, 5UK, (5XA), 5XV, (5YG), (5ZA), 5ZC, 5ZL, 5ZR, 5AAB, 5AAR, (5ACQ), 5AEC, (5XAC), (5ZAW), 5KA, 5XAD, 7BB, 7OT, 8AJ, 8AR, 8CO, 8CS, 8EO, 8EV, 8EW, 8JC, 8JX, 8KJ, 8MZ, 8RQ, 8RR, 8SB, 8TV, 8UC, 8VQ, 8VW, 8YU, 8ZE, 8ABL, 8AEO, 8AFG, 8AHV, 8AIB, 8AIT, 8ANB, 8ARS, 8AVI, 8AWU, 8AXN, 8AYM, 8AXQ, 8AZW, 8BAH, (8BBU), 8BDV, (8BEF), 8BGT, 8BVV, (8BXC), 8CAH, 8CGV, 8CKV, 8CKX, 8COA, 8CYD, 8DWA, 8AU, 8BP, (9CA), 9CP, 9CY, 9DX, 9EX, 9GF, (9HO), 9HT, 9HZ, 9IV, 9KY, 9LF, 9MC, 9OF, 9ON, 9OR, 9PD, 9PE, 9RR, 9TV, 9UH, 9UU, 9UZ, 9VZ, 9YG, 9YM, 9ZN, 9AAR, 9AAW, 9ABM, 9ABV, 9ACB, 9AEG, 9AFK, 9AFW, 9AHO, 9AHZ, 9AIP, 9AIR, 9AIF, 9AJB, 9ALX, 9AMK, 9AMX, 9AOA, 9AOL, 9AOT, 9APS, (9AQE), 9ARG, 9ARZ, 9ASG, 9ASJ, 9ASE, 9ATX, 9AVH, 9AVP, 9AWP, 9AZA, 9AZE, 9AZF, 9BAB, 9BAH, 9BCX, 9BED, 9BEF, 9BEP, 9BEY, 9BIK, 9BKK, 9BLG, 9BME, 9BMN, 9BOO, 9BPV, 9BRT, 9BRW, 9BVO, 9BWS, 9BSN, (9BXC), 9BXE, 9CBU, 9CTW, 9CZL, 9DAJ, 9DAK, 9DAP, 9DAY, 9DBK, 9DCY, 9DCP, 9DCW, 9DDZ, 9DFF, 9DFZ, (9DGV), 9DHB, (9DHD), 9DKQ, 9DMJ, (9DNC), 9DQ, 9DRM, (9DSH), 9DSM, 9DUA, 9DWA, (9DWW), 9DXE, (9DXK), 9DXV, 9DZY, 9XAC, 9YAK, 9ZAF.

5BD & 5TI, Arlington, Texas.

(All districts on 1 tube)

C.W.: 1BWJ, 1CNF, 1BNL, 2APP, 2BWJ, 2BJO, 2CCD, 2WB, 2WR, 2ZK, 3ARC, 3BLF, 3BZ, 3SU, 3TV, 3YO, 4BK, 4CY, 4DL, 4EB, 4EH, 4EL, 4FT, 4IV, 4JF, 4TA, 4XD, 5ABH, 5AEE, 5DO, 5GM, 5GN, 5IK, 5JB, 5NK, 5QT, 5RR, 5SZ, 5TI, 5VO, 5XV, 5BBH, 6CC, 6XW, (6XAD?), 6ZO, 6ZZ, 7PF, 7ZF, 8RA, 7ZO, 8AEA, 8AGO, 8AHE, 8AHR, 8AMB, 8ANB, 8AIX, 8AIO, 8AJH, 8AJY, 8ASV, 8ATC, 8AWS, 8AXB, 8AXC, 8AZB, 8AZH, 8BGJ, 8BHO, 8BK, 8BO, 8BRM, 8BJV, 8BYF, 8BZD, 8CAB, 8CGM, 8CGX, 8CIA, 8CKO, 8CP, 8CVC, 8DAK, 8ER, 8EP, 8FG, 8FV, 8GP, 8HF, 8HH, 8LF, 8MP, 8PT, 8QK, 8SB, 8TT, 8WJ, 8XAK, 8ZN, 8ZW, 8ZY, 9AHE, 9ASE, 9AMU, 9APW, 9BIE, 9BWS, 9CCM, 9CDA, 9COW, 9CWC, 9DDY, 9DKW, 9DYG, 9INF, 9JC, 9OT, 9OX, 9YAD, Canadians 3BV, 3DH, 3TY.

5ZAV, Oklahoma City, Okla. (Every Dist. Worked)

C.W.: 1BDI, 1CY, (1II), 2BMR, (2BQD), 2FP, 2GK, 2QV, 2OM, (3AAY), 3APR, 3APW, 3BGO, 3BLF, (3BVA), 3HD, (3HG), 3CC, 3KF, 3OT, 3XM, 4BR, 4BY, 4CG, 4FA, 4EL, 4EH, 4FT, 4GH, 4JK, 4JM, (4KC), 4KF, 4YA, (5JB), (5MY), (5PO), (5XV), (5ZA), 6ATQ, 6BCB, 6BSA, (6BVG), 6CC, 6EA, 6EB, (6IF), 6JD, 6KA, (6TC), 6XAD, 6ZH, 6ZI, 6ZZ, (7ABB), 7JW, 7ZO, 8ACF, 8ADY, 8AER, 8AAF, 8AGC, 8AFD, (8AIT), 8AIIH, (8ALC), 8ALT, 8APT, 8AQO, 8AKC, 8ASD, (8ASV), 8AWP, (8AWZ), 8AXB, 8AXC, (8AZD), 8AZF, 8BDV, (8BCH), 8BDB, (8BEO), (8BEF), 8BEK, 8BFM, 8BOI, 8BTL, 8BSC, 8BTR, 8BTV, (8BVR), 8BVT, 8BSY, 8BWL, 8BYF, 8BWK, 8BPL, (8CAB), 8CGX, 8CKM, (8CMI), (8CYB), 8CYT, 8CUR, 8DAE, 8DEY, 8AB, 8AD, 8BO, 8BF, 8BK, 8CF, 8CI, 8CQ, 8CY, (8FT), (8FQ), 8HT, 8HH, (8IQ), (8ID), 8IB, 8JU, 8KG, (8NB), 8OI, (8QK), 8SB, 8SP, (8UZ), 8VY, 8WV, 8XE, 8YU, (8ZAF), 8ZW, 8ZY, 8ZZ, (9AQZ), (9BJV), (9BEO), (9BSZ), (9BZI), (9BFG), (9BDS), (9BVY), (9CVO), (9DJB), (9BP), (9ECI), (9CR), (9UU), (9YU), 9ZN, Canadians (3BV), 3CO, (3DH), 3DR.

5DL, 2209 Azle Ave., Fort Worth, Texas

C.W.: 1AW, (1II), 1XM, 1XU, 1XZ, 1XX, 1AAW, 1BKA, 1BWJ, (1CMK), (1CNF), 1CXX, 2BV,

2CC, 2EL, 2GR, 2NZ, 2OS, 2QV, 2UD, 2WR, 2ZK, 2AFP, 2ASO, 2BQD, 2CBW, 2CCD, 2CKR, 2CMA, 2CQZ, 3BZ, 3CA, 3HG, 3HL, 3JT, (3OT), 3QV, 3PZ, 3SD, 3XM, 3YO, 3ZW, 3AAY, 3APR, 3ATZ, 3AUW, 3BEF, 3BGT, (3BHM), 3BIP, 3BLF, 3BVA, 3BZA, 4BX, 4BY, 4CG, 4CO, (4EB), 4EH, 4ES, 4FG, 4GL, 4GS, 4HW, 4ID, 4JZ, (4KC), 4NT, 4UR, 4YA, (5EK), (5EL), 5FV, 5IS, (5JB), (5PV), (5TA), 5TJ, 5UO, 5VY, 5XK, 5XU, 5XV, (5AEC), 5ANO, 6AH, 6CC, 6FT, 6GR, 6GL, (6JD), 6LJ, 6IU, 6ZH, 6ZX, 6AAG, 6AJH, 6ALG, 6ANP, 6AVD, 6AWP, (6AWT), 6BAW, 6BCR, 6BMD, 6BOE, 6BQC, 6BQZ, 6BSA, 6BUG, 6BVG, 6XAD, 6ZAC, 7GW, 7ZO, 7ZU, 8AA, 8AE, 8BK, 8BO, 8CF, 8HJ, 8IB, 8IX, 8ML, 8QK, 8RO, (8VY), 8XC, 8YD, 8YU, (8ZY), 8ZX, 8AED, 8AGZ, (8AIM), (8ALC), (8AME), 8ANB, 8AQO, 8AXC, 8AXD, (8AZD), 8AZF, 8BDV, (8BJK), 8BKE, 8BNZ, 8BTL, (8BVR), (8BWA), 8BXA, 8BXX, 8BYF, (8BYN), 8BZY, 8CFX, 8CGX, 8CJD, 8CKM, (8CKO), 8CPD, 8CUK, 8CUU, 8CYT, 8ZAG, 9EI, 9GR, 9II, (9YU), 9ZL, 9ACB, 9AGZ, 9AGR, 9ALY, 9ANW, (9AOG), (9AON), 9APS, (9APW), (9AQM), (9ARJ), 9ASE, (9ASN), 9ATE, (9ATZ), (9AWM), (9AYS), 9BHD, 9BIE, (9BIK), (9BYV), 9BZZ, 9CBA, (9CCV), 9CES, 9CFC, 9CFG, 9CGK, (9CGL), 9CIY, 9CKP, (9CLZ), 9CMA, 9CTR, 9CVO, (9DBV), (9DDY), (9DEF), 9DKY, 9DTA, 9DYN, (9ZAA), Canadians: (3BY), 3DH, 3GK, 4BK, (4BV), 9AI.

5ADL, 601 Asia St., Baton Rouge, La. (1 tube) (Every District)

C.W.: 1ALW, 1CMK, 1CYJ, 1XU, 2AWL, 2BNZ, 2BSL, 2CCD, 2EL, 2NZ, 2UD, 2WB, 2ZK, 2ZL, 3AFB, 3AQR, 3BHL, 3BIJ, 3BIY, 3BLF, 3BZ, 3CU, 3HG, 3JJ, 3OT, 3TJ, 3ZW, 4BB, 4BK, 4BQ, 4BX, 4BY, 4BZ, 4CG, 4CY, 4DC, 4DL, 4DQ, 4EA, 4EB, 4EH, 4EL, 4FG, 4FS, 4FT, 4GE, 4GH, 4HX, 4IZ, 4JK, 4JY, 4KK, 4KN, 4LI, 4NT, 4SK, 4XK, 4YA, 5AAG, 5AAM, 5AAT, 5ABY, 5ACF, 5ADE, 5AEC, 5AEJ, 5BQ, 5DA, 5DE, 5DN, 5EG, 5EK, 5EN, 5FT, 5FV, 5HL, 5IA, 5IK, 5IM, 5IN, 5IS, 5IX, 5JB, 5JL, 5JM, 5KC, 5LB, 5LO, 5MA, 5MB, 5MC, 5MO, 5MX, 5NB, 5NK, 5NN, 5NV, 5PF, 5PO, 5PV, 5QM, 5SP, 5SR, 5SS, 5TC, 5TJ, 5TM, 5TY, 5UJ, 5UO, 5VM, 5VO, 5WE, 5XA, 5XAD, 5XB, 5XK, 5XV, 5ZA, 5ZAG, 5ZAS, 5ZAT, 5ZB, 5ZH, 5ZO, 5ZS, 6ZU, 6ABX, 6AEH, 6AWT, 6ZZ, 7LY, Can. 3BV, 3CO, 3DH, 3XN.

Fones: 5AAT, 5XAJ, 5XB, 5ZS, 8CGS, 9DYN.

Spark: 4BL, 4DF, 4FB, 4GN, 5ACQ, 5AWS, 5QAT, 5BW, 5CJ, 5FP, 5GQ, 5HU, 5TF, 5MD, 5MO, 5NC, 5QS, 5RA, 5BR, 5SM, 5JP, 5TU, 5UE, 5WG, 5XA, 5XAB, 5XAC, 5YG, 5ZAE.

6ZY, Thos. A. Marshall, Walkiki Beach Honolulu.

1BKA, 2AFB, 2BGM, 2FW, 2FZ, 3GO, 2AWL, 2LO, 3AUU, 3CO, 3DH, 4KM, 4FG, 4ID, 4GH, 4BY, 5AG, 5AEG, 5DI, 5EK, 5EO, 5GV, 5KC, 5NK, 5PX, 5PB, 5SF, 5SK, 5SM, 5TC, 5UO, 5ZAU, 6AK, 6ALU, 6AVR, 6ATG, 6ADA, 6AQU, 6AWT, 6AKT, 6ARF, 6ABX, 6AHQ, 6ASJ, 6ARB, 6AAT, 6AVD, 6BUN, 6BCR, 6BJY, 6BAC, 6BU, 6BIQ, 6BQL, 6BQC, 6CP, 6CC, 6CU, 6CN, 6EN, 6EA, 6EC, 6EB, 6EK, 6GF, 6GX, 6IK, 6IV, 6JD, 6KA, 6PL, 6QY, 6TC, 6TW, 6TI, 6ZG, 7SC, 7BK, 7HM, 7BJ, 7UU, 7ZO, 7LR, 8ANB, 8AQO, 8AIO, 8AIX, 8AMD, 8AWM, 8BO, 8BFM, 8BXA, 8BEF, 8BXH, 8BEO, 8CAZ, 8CGP, 8CMI, 8CF, 8CBD, 8ML, 8ND, 8OW, 8PD, 8XAE, 8YD, 9AUL, 9AMB, 9AWM, 9AXU, 9AOG, 9AWS, 9AVZ, Can. 9AW, 9AWL, 9AM, 9AUX, 9BRQ, 9BB, 9BRG, 9CP, 9CG, 9CCV, 9CFY, 9CIF, 9DPA, 9DTC, 9DSM, 9DKY, 9DTM, 9DPA, 9GK, 9LZ, 9UU, 9WU, 9YAJ, 9ZN, 9ZAF.

6BIP, Winnemucca, Nev.

C.W.: 1BCG, 1BCK, 2AYU, 2BGM, 2BJO, 2BMR, 2BRB, 2BUM, 2CCD, 2CPD, 2EL, 2LO, 2NZ, 2XG, 3AAY, 3AFB, 3BZ, 3CC, 3CO, 3DS, 3LR, 3YO, 3ZN, 4BV, 4BY, 4FG, 4GL, 4JY, 4TV, 5AAK, 5CQ, 5CY, 5DI, 5DO, 5EK, 5EO, 5EX, 5FV, 5KC, 5NK, 5NV, 5VO, 5UJ, 5ZA, 6's and 7's too numerous to mention, 8AK, 8AGO, 8AIM, 8AMM, 8AMQ, 8ANB, 8APT, 8APY, 8AQO, 8AXB, 8BDO, 8BEF, 8BIP, 8BK, 8BPL, 8CA, 8CF, 8CGP, 8CNW, 8IB, 8OU, 8PD, 8XE, 8XL, 8ZAE, 8ZZ, 9ABN, 9AEP, 9AFK, 9AIU, 9AL, 9AMI, 9ARZ,

9ASH, 9ATQ, 9AUA, 9AUL, 9AUM, 9AVZ, 9AWM, 9AXQ, 9AXU, 9BBF, 9BGF, 9BED, 9BHG, 9BIK, 9BKJ, 9BL0, 9BVO, 9BRI, 9BRK, 9BRN, 9BTE, 9BTT, 9BUD, 9BXT, 9CBA, 9CBB, 9CCS, 9CCV, 9CFY, 9CIE, 9CIP, 9CK, 9CMK, 9CPY, 9DCU, 9DKY, 9DSM, 9DSW, 9DTM, 9DYN, 9DZY, 9GK, 9GP, 9II, 9KP, 9MX, 9OX, 9PI, 9PS, 9NU, 9GF, 9UU, 9XL, 9YAJ, 9ZAA, 9ZN, 9ZX.

6ZAC, Walluku, T. H.

C.W.: 1BCG, 1XM, 2AWL, 2AGC, 2FP, 2GK, 2GR, 2BFX, 2NZ, 2XAP, 3ZW, 4EH, Canadian 4BV, 5DI, 5EK, 5KC, 5SF, 5TJ, 5QY, 5PX, 5XD, 5XY, 5ZA, (6AK), 6AJH, 6ASJ, 6AVR, (6AWT), 6ADA, 6ATG, 6BCQ, (6BCR), (6BSA), 6BQG, 6BJU, 6BDW, 6BVQ, (6CC), 6CU, (6EA), (6EN), 6EB, 6GF, (6GR), 6GX, 6KA, 6NX, 6PI, (6TC), (6TI), (6TQ), 6WI, (6XJ), 6XAD, 6ZB, (6ZG), 6ZH, (6ZN), (6ZI), (6ZX), (6ZY), 6ZAF, 6ZAL, 6XAW, 7BB, 7BK, 7BJ, 7ADP, 7GK, 7RN, (7SC), 7SY, 7ZU, 7ZY, 8AMM, 8APY, 8AWP, 8AZD, 8BEF, 8CF, 8CUR, 8BKE, 8CUZ, 8IB, 8NB, 8UK, 8XE, 8ZY, 8XH, 9AW, (9AWM), 9AUL, 9ARZ, 9AXM, 9AMI, 9AWT, 9AQE, 9AYS, 9AMB, 9AVZ, 9APW, 9APS, 9AOG, 9BJJ, 9BBF, 9BEY, 9BCH, 9BRI, 9BDS, 9CNS, 9CCV, 9CFY, 9CGK, 9DGS, 9DYN, 9DSP, 9DSM, 9DTM, 9DFB, 9GK, 9PI, 9YAJ, 9YW, 9ZN, 9ZAF, 9ZX.

Spark: (6AQU), (6EX), 6OH.

6KA, Los Angeles, Calif.

1AQW, 1XZ, 2XY, 3ABD, 3BHM, 3BLF, 3XW, 3ZO, 4FJ, 4GH, 4XC, 4YA, 5AEC, (5DI), 5EK, 5FV, (5KC), 5NK, 5OD, 5QY, 5SK, 5TJ, 5UJ, 5XAD, 5XD, 5ZA, 5ZAI, 5ZAD, 5ZH, 5CN, (6ZAC), 7BJ, 7CZ, 7FD, 7JW, (7LU), 7PF, 7SC, 7TQ, 7WM, 7YG, 7ZB, 7ZO, 7ZU, 8AB, 8ALC, (8AQO), 8ASV, 8ATU, 8AWX, 8AXB, (8AXC), (8AZD), 8AZF, (8BEF), (8BFM), 8BK, 8BKE, 8BPL, 8BRC, 8BSS, 8BUM, 8BVR, (8BXH), 8BXX, (8CAZ), 8CF, 8CGM, 8CGX, 8ID, 8JU, 8KC, 8KG, 8QK, 8SB, 8UE, (8XE), (8YD), 8ZAF, 8ZD, 8ZW, 8ZX, (8ZY), 8ZW, 9AA, 9AAF, 9AIY, 9AJF, (9AMB), 9AMI, 9ANQ, (9ANS), 9AOG, 9AON, 9AOR, 9AOU, 9APS, 9APW, 9AQM, 9ASF, 9AUL, 9AVZ, 9AW, (9AWM), (9AXU), 9AYH, 9AYS, 9BAC, (9BED), 9BEY, 9BHD, 9BIK, (9BJI), 9BLO, 9BM, 9BTI, (9BUN), 9BXA, 9BXQ, 9BZI, 9BZN, 9CCV, 9CFY, 9CGP, 9CMK, 9CNS, 9DFB, 9DKY, 9DP, 9DPM, 9DR, 9DSM, 9DTM, 9FM, (9GK), (9II), 9IK, 9PI, (9PS), (9UU), 9XAC, 9XAI, (9XAQ), 9XAY, 9YAJ, 9YAT, 9YI, 9YU, 9ZAA, (9ZAF), (9ZN), AD-7 Canadian (9AC), 9AL, 3CO, (4BV).

6XAD, Catalina Island, Calif.

C.W.: (2EL), (3BLF), (3BFM), (3BHM), (5IK), (5DA), (5XAD), (5EK), (5BX), (5ALC), (8ZY), (8ASL), (8BEO), (8AWP), (8AQO), (8ZY), (8AXC), (8CQX), (8CKO), (8AOL), (8ASV), (8NB), (8ADT), (8YD), (8CK), (8BKE), (8BUM), (8CAZ), (8CGX), (8BXH), (8LT), (8ALT), (8AM), (8BVR), (8AZF), (8CKM), (8BDV), (8ALT), (8VY), (8BSS), (8AME), (8XE), (8BF), (8ZY), (8BSS), (8AXI), (8ZY), (8ASL), (8CKM), (8CKO), (9BED), (9YAJ), (9DR), (9ZN), (9AWM), (9DFB), (9ECR), (9ARZ), (9CTR), (9BFG), (9BIE), (9BDS), (9DFB), (9EI), (9DKY), (9CTR), (9CNS), (9BZI), (9BIK), (9DFB), (9BZI), (9APS).

7GE, 110 So. 7th St., Pasco, Wash.

(Every district on 20 ft. wire and one step)

C.W.: .1X7 (Funny list), 2ZS, 3DH, 3HG, 3OT, 3SU, 3YO, 4JM, 5NR, 5TJ, (6AK), 6AV, 6CU, 6FN, 6GF, 6GR, 6GX, 6GY, 6KA, 6KU, 6NX, 6PI, 6RM, 6TC, 6TL, 6VM, 6XJ, (6ZF), 6ZH, (6ZFI), 6ZH, (6ZX), 6ZZ, 6AAQ voice and CW, 6ABX, 6AHQ, 6AIX, 6AIY, 6AME, 6AWN, 6AOL, 6AQW, 6ABR, 6ASJ, 6ATG, 6ATG, 6AUU, 6AVE, 6AVR, 6AWT, 6BAZ, 6BBC, 6BCJ, 6BCL, 6BCO, 6BES, 6BIN, (6BIP), 6BJQ, 6BJR, 6BPZ, 6BQG, 6BRF, 6BUM, 6BUN, 6BVQ, 7's too numerous, 8XE, 8XJ, 8ZM, 8ZY, 8ZP, 8AAF, 8AQO, 8AZB, 8BTU, 8BXH, 8CGP, 8DTA, 9DY, 9GK, 9II, 9KP, 9PN, 9PS, 9VE, 9XU, 9YW, 9ZM, 9ZY, 9ZX, 9AHH, 9AIY, 9AJF, 9AMB, 9AMI, 9ANI, 9ANG, 9AOU, 9APW, 9AQR, 9ARZ, 9ASF, 9ASN, 9ATN, 9AUL, 9AVZ, 9AWM, 9AYS, 9BBF, 9BCF, 9BCH, 9BCV, 9BDS, 9BED,

9BHD, 9BIK, 9BJI, 9BJV, 9BLT, 9RI, 9BVY, 9CCV, 9CEH, 9CHN, 9CFY, 9CMK, 9CNS, 9COW, 9CKP, 9DEL, 9DGE, 9DKY, 9DSM, 9DTE, 9DTM, 9DYG, 9DYN, 9EBS, 9XQA, 9ZZA, 9ZAF. Canadian 4BV voice and C.W.

Spark: 6AO, 6EW, 6GR, (6LU), (6QR), 6RK, (6TU), 6VX, (6ABK), (6ABW), (6AKT), (6AMK), (6AMW), (6AMZ), 6AOS, (7BH), (7HD), (7IA), (7KJ), 7LY, (7OF), (7OJ), (7QH), (7RO), (7VE), (7VF), (7ZK), (7ZU), 9AUL. Canadians: 3EC 9AX.

7JF, Moscow, Idaho.

4DK, 5AK, 5CN, 5KC, 5TC, 6AJT, 6AWT, 6BQC, 6FF, 6KOF, 6XAD, 6ZK, 6ZF, 6ZO, 6ZNC, 7AF, 7ACQ, 7AEK, 7BK, 7CU, 7QT, 7PF, 7WF, 7WG, 7LU, 7LY, 7YL, 7ZK, 7ZU, 8BSS, 8TT, 9ARA, 9AWM, 9BJ, 9BR, 9BED, 9BDS, 9BOC, 9CF, 9CN, 9CNS, 9CG, 9CLQ, 9DKY, 9DTM, 9KC, 9QA, 9XAD, 9ZII, 9ZN.

7AFH, Monroe, Wash. (1 tube)

C.W.: 1BDI, 2AWL, 5AA, 5DI, 5EK, 5FV, 5HB, 5JL, 5KC, 5KP, 5NK, 5PX, 5QI, 5SK, 5XT, 5ZA, 5ZAV, 5AAG, 5AAT, 5AAV, 5AAX, 5ABX, 5AGF, 5AHD, 5AHQ, 5AIY, 6AJF, 6AJH, 6AK, 6ALU, 6ALV, 6ALX, 6AOL, 6APW, 6AQI, 6AQW, 6ARB, 6ASJ, 6ATC, 6ATQ, 6AUU, 6AVR, 6AW, 6AWP, 6AWT, 6BCD, 6BCJ, 6BCL, 6BCR, 6BEG, 6BEJ, 6BCL, 6BIN, 6BIQ, 6BJC, 6BJQ, 6BJR, 6BKO, 6BMD, 6BNT, 6BOE, 6BOC, 6BPZ, 6BQC, 6BQD, 6BRF, 6BQG, 6BQZ, 6BRG, 6BSA, 6BTD, 6BUD, 6BUM, 6BUN, 6BVQ, 6BZB, 6CC, 6CN, 6CF, 6CU, 6EC, 6EN, 6FH, 6FT, 6QR, 6GX, 6GY, 6JD, 6KI, 6KU, 6LV, 6NX, 6PI, 6QM, 6RD, 6RM, 6TC, 6TL, 6UW, 6VF, 6VM, 6XAD, 6XH, 6XJ, 6XAS, 6ZF, 6ZH, 6ZO, 6ZS, 6ZX, 6ZZ, 8AB, 8AFD, 8APY, 8ASU, 8ASV, 8AXB, 8AZD, 8BDU, 8BEF, 8BK, 8BNJ, 8BUM, 8BXH, 8BXR, 8BYT, 8CFZ, 8CGX, 8CIA, 8CM, 8CMI, 8CMX, 8CSR, 8CUR, 8DAK, 8GF, 8IB, 8KG, 8OW, 8QK, 8VK, 8XJ, 8YD, 8ZAG, 8ZY, 8ZZ, 9AAI, 9AAU, 9ABU, 9AFK, 9AHH, 9AIY, 9AJH, 9AJF, 9AMB, 9AMI, 9ANI, 9ANQ, 9AOU, 9APS, 9APW, 9ARZ, 9ASU, 9ASV, 9ATN, 9AUL, 9AWM, 9AXU, 9BAZ, 9BBF, 9BDS, 9BED, 9BEY, 9BHD, 9BHK, 9BIK, 9BJI, 9BJV, 9BSZ, 9BUD, 9BXA, 9BXQ, 9BZI, 9CCV, 9CKM, 9CMK, 9CNS, 9CR, 9CSN, 9CXP, 9DBV, 9DDJ, 9DDY, 9DG, 9DGE, 9DGL, 9DIM, 9DJM, 9DKY, 9DR, 9DSM, 9DVK, 9DYN, 9EJ, 9GK, 9HM, 9II, 9KP, 9PI, 9PN, 9PS, 9RK, 9UP, 9UU, 9UX, 9XAC, 9XAJ, 9YAJ, 9ZAA, 9ZAF, 9ZX. Canadians: 3CO, 8DH, 8NB, 3XN, 4BV, 4DQ, 5BQ, 5CN, 5CT, 5DO, 9AC, 9AW, 9AL, 9BG. Spark: 6ACR, 6ALA, 6AMK, 6AMW, 6AO, 6ARK, 6AWH, 6BIP, 6BTB, 6CC, 6GR, 6IC, 6KM, 6QR, 6TC, 7AD, 7BK, 7FR, 7GE, 7GO, 7HD, (7IM), 7JF, 7NE, 7NW, 7OT, 7OW, 7TQ, 7TW, 7VE, 7VF, 7VO, 7YR, 7YL, 7YR, 7ZK, 7ZU, 8Q8, 9ZC. Can. 5DX, 9BD.

BT3, Cpl. R. E. Jenkins, Camp Lewis, Wash.

Spark: Canadians, 3EC, 3KO, Americans, 5TU, (7GE), (7TW), (7VF), 9DAG.

C.W.: Americans, 5DX, 5EK, 5ER, 5ES, 5EO, 5NK, 5PX, 5SK, 5TO, 5XD, 5XT, 5XAD, 5ZA, (6AJF), (6AWT), (6BCR), (6CC), (6LO), (6LV), (6EA), 6XAC, (6XAD), (6ZX), (7AEM), (7AIM), (7BJ), (7LU), (7MF), (7OT), (7QT), (7SC), (7SY), (7NY), (7TN), (7TH), (7TQ), (7ZB), (7ZO), 8AN, 8AX, 8ASV, 8DAG, 8QK, 8SB, 8TDZ, 8UK, 8WR, 8XB, 8XE, 8ZY, 8ZZ, 9AEZ, 9AIN, 9AJP, 9AMB, 9AMI, 9ANQ, 9APW, 9APZ, 9ARZ, 9AUL, 9AVZ, 9AWM, 9BCF, 9BDS, 9BHD, 9BJI, 9BJV, 9BRI, 9BSP, 9BXA, 9CCM, 9CCV, 9CNS, 9DCR, 9DGE, 9DKY, 9DOZ, 9DSM, 9EI, 9EBT, 9GK, 9HM, 9II, 9KJ, 9LZ, 9PI, 9PS, 9UU, 9UCU, 9XM, 9XQA, 9YF, 9YG, 9ZAA, 9ZAF. Canadians: 4BV, 4DQ, 4GR, (5BQ), 5CN, (5CT), (9AC).

8KW, Buffalo, N. Y.

(Every District on 1 tube)

1BKA, (fone), 2BRB, 3BNU, 4BX, 4DY, 4EA, 4FT, 4GL, 4KC, 4KT, 4LJ, 5AAG, 5DA, 5EK, 5ER, 5ES, 5FV, 5JD, 5MD, (5PK), 5NV, 5PK, 5SA, 5SM, 5TJ, 5VA, 5XA, 5XT, 5XK, 5ZA, 5ZAS, 5ZX, 6ACR, 6AVD, 6XAD, 7ZO, 9ZN, Can. (3P).

(3BHM) dalite, 3BIJ, 3BLF, 3BLU, 3BVA, 3BX, (3BZ), 3CC, 3CK, 3CMS, 3FP, 3HD, 3JH, 3OE, 3OT, 3PZ, 3SW, 3SX, 3UI, 3XN, 3YO, 3ZO, 4BK, 4CG, (4CQ), 4EL, 4BG, 4FT, 4JN fone, 4MI, 4OI, (4XC) fone, 4VA, 5AAH, 5AAG, 5AEC dalite, 5AX, (5DQ), 5DR, 5ER, 5ES, 5IX, 5JB, 5JO, 5MA, 5MO, 5MY, 5NK, 5NN, 5GY, (5TA), 5TC dalite, 5UK, 5UO dalite, 5XA, (5XAC), 5XK, 5XT, 5XO dalite, 5XAS, 5ZAV, 5ZB, 5ZS dalite, 6BJT, 6BVG, 6IF, 6TI, 6XAD, 6ZO, 6ZR, 7AFW, 7JW, 7OT, (8AHA), 8AIQ, 8ALC, (8AME), 8AMP, (8ANB), 8AOL, 8APQ, 8AQC dalite, (8ASV), 8AWC, 8AWP, 8AMR, 8AWS, 8AWZ, 8AVD, 8AZF (8BDC), 8BDU dalite, (8BDV), 8BEO, 8BFR, (8BGL), 8BHO, 8BJV, 8BKE, 8BKN, 8BRL, 8BUT, 8BVT, 8BXM, 8CAK dalite, 8CBC, 8CBX, 8CCR, 8CEP, 8CHM, 8CGU, 8CJZ, 8CK dalite, 8CKO, 8CNW, 8COZ, 8CPD, (8CPX), 8CQX, 8CRB, 8CVM, 8CWL, 8DAA, 8DAE dalite, 8DAK, 8EO, 8ER, 8FS, 8HH, (8HJ), 8KG, 8KS, 8ML dalite, 8NB dalite, 8QK, 8RR, 8UF, 8WF, 8XAK, 8XE, 8YU, 8ZAE, (9ASE), (9OX), and many others. Canadians: 3CO, 3DH, (3DS), 3GK, (3JE) 3JK, 3TY, (4BV), 4DK, 5CN, 8XN, 9AL, WUBA.

9ARZ, Clear Lake, Ia.

C.W.: 1AW, (1II), 1XU, 1XZ, 1AJU, 1AVC, 1BRQ, (1CMK), 2RZ, 2CK, 2UC, (2UD), 2WB, (2WR), 2AFP, 2AHO, (2AVU), 2AWZ, 2BMS, 2BRB, 2CCD, 2CKL, 2CNK, (2CQZ), 3AZ, 3BG, 3BI, 3BV, 3BZ, 3CM, (3IW), 3MB, (3OT), 3VW, 3XM, 3YO, 3ZO, 3AFW, 3AJH, 3APR, (3AQR), 3BHM, 3BLF, 3BNU, (3BVA), 3BVL, 4BK, 4BG, 4CG, 4CO, (4CY), 4DC, 4EA, 4EH, 4GH, 4GZ, 4HS-sp., 4HV, 4JK, (4KC), 4LJ, 4SL, 4DI, 5DO, 5EK, 5ER, (5IK), 5IS, (5KP), 5LB, 5MO, 5OU, 5PB, 5PV, 5PX, 5QM, 5RJ, 5QM, 5XJ, (5SF), (5SM), (5TA), 5UO, 5WE, 5XA, 5XK, 5XT, (5XV), (5ZA), 5ZB, 5ZH, (5AAM), 5AAG, 5AAR, (5AEC), 5XAC, 5ZAG, 5ZAI, 5ZAP, 5ZAS, 5ZAV, (5JD), 6IF, 6ZN, 6ZZ, 6ASO, (6AVR), (6XAD), 6ZAC, 6ZAF, 6ZAL, 7GK-sp., 7ZU, 7ABB, 8AB, 8BK, 8CF, 8CG, (8ER), 8FM, 8FT, 8HJ, (8OE), 8QQ, (8VQ), 8SB, 8UE, 8UZ, 8XE, 8XJ, 8YN, 8ZD, 8ZY, 8AEA, 8AER, (8AFV), 8AIM, 8AIZ, 8ASL, 8ATU, (8AVD), (8AXC), (8AXB), (8AXN-sp.) 8BEU, 8BDA-sp., 8BDU, 8BFM, 8BFS, 8BHO, 8BKS, (8BNY), (8BTL), 8BVX, (8BWA), 8BWP, 8BXT, 8BXX, (8BYN), 8CBC, 8CCM, 8CEP, 8CGX, 8CIA, 8COJ, 8CPD, (8CUR), 8CVY, 8CWF, (8CZZ), 8DAT. Canadians: 3DH, 3GN-sp., (4BV), (4DK), 9's too numerous.

Hard During daylight Transcons: 1XU, Can. 3DH, (3SU), 3BVA, 4BQ, 5GI, 5PX 5TA, 5UN, (5UO), 5AEC, 8BO, 8QK, 8YZ, 8ADZ, 8AIO, 8APE, 8AXC, 8BDU, 8BNU, 8BXY, 8ZAG, 9AP, (9BP), 9II, 9OX, 9PI, 9VK, 9ZL, 9AAW, 9ABV, 9AEQ, 9AEY, 9AHH, 9APW, 9AMB, 9AON, 9AOU, 9AQR, 9APS, 9AU, 9AWS, 9ASD, 9ASF, 9ASN, 9AZF, 9BAL, 9BCF, 9BRD, (9BGH), 9BHD, 9BHN, (9BKK-sp.), 9BSP, 9BSZ, 9BT, 9BRK, 9BYC, 9BXJ, 9CCV, (9CEH), 9CFI, 9CFY, 9CTR, 9CXF, 9DBV, 9DDY, 9DEK, 9DFB, 9DJB, 9DQU, 9DSM, 9DTJ, 9DTA, 9XAK.

9DKY, Mason City, Iowa. (1 tube)

C.W.: 1GV, (1II), (1RD), 1AKP, 1ASF, 1AZL, (1AZW), 1BET, 1BGF, 1BKA, 1BRQ, 1CJA, (1CLF), (1CMK), 1CNF, 1XM, 1XU, (1XZ), 2CM, 2EL, 2GR, 2HW, (2IG), (2LO), 2OE, (2RZ), 2TS, 2VW, 2WB, 2WR, (2AAG), (2AFP), 2AHO, 2AJP, (2ANM), 2AWF, (2AWL), (2AYV), (2BFX), (2BGV), (2BNZ), (2BRB), 2BNR, 2BOF, (2CCD), 2CCX, 2CHG, 2CKR, 2CPD, (2CQZ), 2XB, 2XQ, 2ZK, 2XAP, (2AB), 3BB, 3BG, 3CC, 3HG, 3HK, 3JJ, 3KD, 3LP, (3LR), 3MK, (3OE), (3OT), (3SN), 3TJ, 3AFB, 3AJD, (3AJH), (3ANJ), 3AQR, 3ATZ, 3AUU, (3AWF), (3AYV), 3BBA, 3BFA, (3BHM), 3BIT, (3BLF), 3BNJ, 3RSB, (3BVA), 3CMS, (3YO), (3ZO), 4BB, 4CM, 4EB, 4FT, (4KF), 4KM, 4BK, 4HI, (4FG), (4CG), 4JK, (4YA), (4DN), (5DO), (5EG), (5EK), (5HB), (5IS), 5FV, (5IK), 5JL, (5KC), (5MO), (5MX), (5NV), (5PO), (5PY), (5PV), (5PX), (5SM), (5SZ), (5TC), 5TU, 5UE, (5UK), 5UN, (5VY), (5AAB), 5AAT, (5ABH), (5ADE), (5AEC), (5ZA), 5ZB, (5ZAZ), (5XAD), (5XA), 6HM, 6AAT, 6ABX, 6ATC, (6AVR), 6AUU, 6BBH, 6BRG, (6BQC), 6BUM, 6BUN, (6ZO), 6ZR, 6ZZ,

6ZAC, (6XAD), (7LU), 7ABV, 7AFS, 7AFW, 7ZO, 7ZU, (8AR), (8AZ), (8BK), 8CP, (8FT), (8HH), 8IB, (8IJ), 8KG, 8LF, 8ML, (8OE), 8QK, (8SP), (8NB), 8AAF, 8AAK, 8AEA, 8AEC, 8AFD, 8AIM, (8AIG), (8AIW), 8AMM, 8AMP, (8ATU), (8APY), 8AWP, (8AWR), (8AWZ), 8AXC, (8AYD), (8AVD), (8AUO), 8AXB, (8BDE), 8BDP, (8BDV), 8BDU, 8BEF, (8BEI), (8BLO), (8BXH), (8BYN), (8CAB), (8CBC), 8CGA, (8CGX), (8CKO), 8CKM, 8CTP, (8CUR), 8VE, (8CVT), 8CYT, (8DAT), 8YD, 8ZX, (8ZZ), 8YM, (8ZD), (8XE), 8XAK, (8ZAG). Nines too numerous. Canadians 2AM, (8CO), (8DH), 3DS, (3YH), 8GE, (4BV), (4DK), 5GI.

9DVL, Box 77, Naperville, Ill.

1AFB, 1AGH, 1AIP, 1AJA, 1AJU, 1AW, 1AWB, 1BEF, 1BES, 1BET, 1BGF, 1BKA, 1BKO, 1BNT, 1BQI, 1BRQ, 1BWJ, 1CDO, 1CIX, 1CJA, 1CJH, 1CMK, 1CNF, 1CNR, 1II, 1PR, 1RD, 1XM, 1XP, 1XU, 1XZ, 1YK, 2AGC, 2AHO, 2AJA, 2AWL, 2BAS, 2BFX, 2BGM, 2BJO, 2BLP, 2BMR, 2BMS, 2BPF, 2BRB, 2BRC, 2BRW, 2BXP, 2CAB, 2CBW, 2CCD, 2CKL, 2CKM, 2CKR, 2COA, 2CPD, 2CQZ, 2EL, 2FP, 2GN, 2IX, 2LO, 2LT, 2NZ, 2TS, 2UD, 2UE, 2WB, 2ZK, 2ZO, 2ZS, 3ADT, 3AFB, 3AQR, 3ASP, 3ATG, 3AUU, 3AVC, 3AVW, 3BAV, 3BFU, 3BH, 3BHL, 3BHM, 3BIJ, 3BLF, 3BNG, 3BRB, 3BSB, 3BT, 3BUV, 3BVA, 3BVC, 3BWT, 3BZ, 3CC, 3DH, 3DS, 3FS, 3HJ, 3IL, 3JH, 3LP, 3OT, 3PQ, 3RF, 3SM, 3ZO, 3ZW, 4BB, 4BG, 4BV, 4BX, 4BY, 4CA, 4EB, 4EH, (4EL), 4FT, 4GH, 4HW, 4ID, 4JK, 4JY, 4KC, 4KM, 4LJ, 4LP, 4OI, 4OT, 5AAT, 5ACF, 5AS, 5BA, 5BM, 5DA, 5DI, 5DO, 5DP, (5EK), 5EL, 5FV, 5GA, 5IK, 5IS, 5IX, 5JB, 5JL, 5JM, 5KC, 5LB, 5MO, 5NE, 5NK, 5NN, 5NX, 5OI, 5PB, 5PF, 5PV, 5PX, 5QI, 5QY, 5RH, 5RS, 5SA, (5SF), 5SG, 5SK, 5SM, 5TC, 5TJ, 5TO, 5TP, 5UC, 5UO, 5VM, 5XA, 5XAC, 5XAD, 5XDO, 5XV, 5ZA, 5ZAG, 5ZAS, 5ZAV, 5ZAW, 5ZB, 5ZS, 6ABX, 6AJH, 6ARB, 6ASJ, 6AWT, 6BUN, 6BUM, 6CC, 6CU, 6EN, 6EO, 6GX, 6KA, 6LS, 6PI, 6UW, 6XAD, 7AD, 7AFW, 7LU, 7ZO, 7ZU, 8AAV, 8ABN, 8ABX, 8AFG, 8AHK, 8AIM, 8AIW, 8ABZ, 8ACH, 8AEA, (8AER), 8AGO, 8AGR, (8ALF), (8ALC), 8ALR, 8ALT, 8AMJ, 8AMM, 8ANB, 8AOM, 8APN, 8AQO, 8ASK, 8ASV, 8ATO, 8AWP, 8AWT, 8AWX, 8AWZ, 8AXB, 8AXC, 8AXN, 8AZD, 8AZF, 8AZO, 8BCA, 8BCE, 8BCY, 8BDM, 8BDO, 8BEF, 8BEI, 8BEK, 8BEO, (8BFM), 8BHO, 8BHQ, 8BJX, 8BKE, 8BKH, 8BNP, 8BNU, 8BOS, 8BOX, (8BOZ), 8BPU, 8BRM, 8BSU, (8BTL), 8BTR, 8BTZ, (8BUC), 8BUX, 8BVR, 8BVT, 8BVX, 8BWA, 8BWB, 8BXC, 8BXH, 8BXT, 8BXX, 8BYF, 8BZY, 8CAB, 8CAK, 8CAU, 8CAZ, 8CBC, 8CEF, 8CF, 8CGP, 8CGU, 8CGX, 8CGZ, 8CH, 8CJV, 8CJY, 8CKO, 8CLD, 8CMY, 8CN, 8CNA, 8CNX, 8COO, 8COX, 8CP, 8CPZ, 8CTP, 8CTN, (8CUR), (8CVE), 8CVT, 8CYT, 8CYU, 8CZC, 8DAG, (8DZ), 8FA, 8FF, 8FM, 8FT, 8GT, 8GV, 8HB, 8HH, 8HJ, 8HW, 8IB, 8IJ, 8IQ, 8JO, 8JU, 8KG, 8LW, 8ML, (8OE), 8OK, 8OW, 8PD, 8QB, 8QK, 8SB, (8SP), 8TX, 8UK, 8UZ, 8VE, 8VY, 8WA, 8XAE, 8XE, 8XN, 8YN, (8ZAF), 8ZD, 8ZX, 8ZZ, (9AAP), (9AAV), (9ABM), 9ABL, (9AFK), (9AFN), 9AHE, 9AHQ, 9ANQ, 9AOY, 9APH, 9APS, (9ASA), (9ASU), 9ATC, 9AUA, 9AWF, 9AWM, 9AXO, 9AYH, 9AYM (9AXU), (9BEF), 9BFX, (9BHD), 9BIK, 9BIZ, (9BJT), (9BJV), 9BJU, (9BKJ), (9BLG), (9BQI), 9BQW, (9BRE), (9BRO), 9BRL, (9BSC), 9BSZ, (9BTA), (9BWS), (9BXD), (9BZO), (9CA), 9CCS, 9CCV, (9CDZ), (9CEB), (9CEH), (9CEW), (9CFC), 9CFY, 9CGD, 9CGK, (9CHK), 9CHN, (9CIN), 9CJL, (9CLO), (9CP), (9CTF), 9CTR, 9CUC, 9CVO, 9CVD, 9DBX, 9DCQ, (9DCT), 9DFB, (9DJG), 9DMK, 9DPE, (9DQE), (9DTC), (9DTJ), (9DVW), (9DWQ), 9DXN, 9DYN, 9DZB, 9EW, (9FK), (9GL), (9GT), 9IO, 9KM, (9OH), (9OX), (9XAK), 9YG, (9ZAF), Canadians: 9AL, 9AW, 3BP, 3CO, 3DH, 3DS, 3JI, 3LK, 3NB.

The Ravenswood Radio Club Razz, published in Chicago, is a mighty interesting little sheet. Wendell L. Holst, 2450 Linden Place, is its editor and we know it will continue to get across big.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents.



More on Filament Adj.

G. E. Research Lab.,
Schenectady, N. Y.

Editor, QST:

Mr. Chisholm's letter in the December issue on tungsten filament volt-ampere relations gives some conclusions that do not apply to the tungsten filaments of vacuum tubes.

It is a fact that during life the tungsten evaporates from the surface and the filament diameter decreases. It is also a fact that at constant filament current the temperature and electron emission increase and the life is greatly reduced.

At constant voltage, however, there are two effects which take place that make operation by this method the most satisfactory.

1. At constant voltage the temperature does not drop to the extent indicated by the simple theory, because of the fact that the resistivity of the tungsten slightly decreases during life of the filament.
2. Satisfactory operation of the tube in radio equipment requires that the electron emission rather than the filament temperature be maintained above a certain value. The relation between filament temperature and electron emission is subject to considerable variation, depending upon conditions on the surface of the filament. During life the surface conditions change so that with a constant temperature there is a slight increase of electron emission.

Actual tests on a considerable number of tubes of different types indicate that at constant filament voltage the current drops during life from five to ten per cent, but that the value of electron emission on the average remains practically constant. The two factors listed above account largely for this action.

These remarks do not apply strictly to the UV-200 tube, because its gas content introduces complicated features.

The heavy filaments of high power tubes, however, show this same advantage of operation at constant voltage.

Filament voltmeters are of less practical value in the case of receiving tubes, because there are so many different circuit

combinations and voltages used on the plates that there is often an optimum filament adjustment below the rated value. In such cases, of course, this lower value should be used.

In general, a filament ammeter is but of little value for any size of ordinary tungsten filament tube, and is likely to do more harm than good.

Very truly yours,
William C. White.

Favoring the Voltmeter

Pacific Union College,
St. Helena, Calif.

Editor, QST:

In the October number of QST I notice a letter by R. O. Miles on "Ammeters vs. Voltmeters." Mr. Miles recognizes that there is some condition that must be duplicated to duplicate results in a receiving tube, but does not seem to know, at least did not say, just what it was that must be kept constant.

The action of the vacuum tube depends upon the electrons emitted from the filament, and it is identity in the number of electrons emitted per second that should be preserved in order to duplicate results. But the rate of emission of the electrons depends largely upon the filament temperature, and so to keep the emission constant, the temperature of the filament should be a constant. Does a constant current fulfill this condition? I believe not. As the filament is burned, it gradually vaporizes and so becomes smaller in cross-section and mass, and of course the resistance goes up. As the heat produced depends upon the current squared times resistance, this increase of resistance will increase the amount of heat produced. Also, temperature depends upon the ratio between the number of calories produced and the mass to be heated, so as the mass of the filament becomes less, even the same amount of heat would raise it to a higher temperature while an increase in the amount of heat produced, would give the temperature quite a boost.

On the other hand, does constant voltage across filament fulfill the requirement? I believe it does, very nearly at least. A numerical example would perhaps help. Suppose the cross-section is reduced to one-half its original value by vaporization. Then the resistance is doubled. But the mass is cut in half. If the resistance is

doubled, and the voltage held constant, the current will be cut in half, and current squared will be only one-fourth its original value. Our relation between units is ex-

pressed by the formula, $\frac{I^2 R}{M} = \text{a constant}$,

(or should, to keep temp. constant). Substituting the fractions found above, $\frac{1}{4} \times 2$

$= 1$, in other words, is the same

as in the original value. So it seems to me that voltage across filament terminals is what we want to keep constant.

As to poor contacts, they must be eliminated to secure satisfactory operation anyway, so constitute no objection to the voltmeter. What about it?

Sincerely,
Julian L. Thompson.

"Our Etiquette Column"

Dear Editor:

I have recently been at several receiving stations where the owner of the set insisted on listening to broadcasted concerts. At least once in every concert the Star Spangled Banner is played. The audience always seems to be greatly worried about the proper thing to do; half of them remain seated and the other half get up and stand about uneasily while the piece comes in.

Please advise me as to the correct procedure.

9NK.



Dear 9NK:

If the operator can separate the Star Spangled Banner from other things, you should stand. If, however, the piece comes out badly mixed up with the Lord's Prayer from the Church of the Covenant in Washington, that heavy generator hum from KYW at Chicago, a negro melody from

WSB in Atlanta, and some California weather boosting from Los Angeles, you need not stand. Never under any circumstances stand when you are sure that the noise is a howl from WGI at Medford Hillside, Mass., even tho the entire gang with you insists that it is the national anthem.

Personally we think the playing of the Star Spangled Banner should be reserved for patriotic occasions where its playing will be accorded proper respect. We have no enthusiasm for hearing our national anthem tangled up with the price of hogs. —Ed.

Well, Well!!

Editor, QST:

Since it is all the style these days to raise an awful kick, I'll take this chance to tell you of some things that make me sick. Now in regard to radio there's nothing I don't know, because I've had a wireless set about two months or so.

Now first I'd like to tell about these pesky fellows who, begin to operate their sets before the hour of two. Now anyone with half an eye can very plainly see, that broadcast listeners ought to have the air from seven till three. Why should these operators fill the air with clicks and hums, and want to sit and pound a key whenever midnight comes, so I can't understand a word that John McCormick hollers, and I've just bought a radio set that cost me twenty dollars.

I understand you've got a league, or something of the kind, that numbers as its members all these chaps I have in mind, and so I thought I'd warn you first, as it seems only right, before I write to Congress and have you closed up tight. And also when I write to them I'm going to recommend that laws be passed which have the power to totally suspend the action of this "static" and "fading" signals too, for anything that conflicts with my concerts is taboo.

Now that you've had fair warning, and I have had my say, please do not be a bit surprised if you're closed up some day, for though some things in radio, to me, are 'neath a fog, the concerts are the important thing.

Yours truly,
Ima Hogg.

Beat This One!

5723 Winthrop Ave.,
Chicago, Ill.

Editor, QST:

I am bothering you again a lot sooner than I had intended to. Something mighty unusual has happened to me. After trying for two years I have finally by pure luck managed to hear *nine consecutive stations, one from each district.*

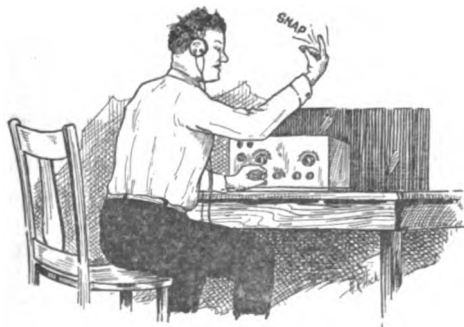
After finishing the "Calls Heard" list and getting the letter off to you and Phelps,

I slipped on a bathrobe and took my usual "pre-hay" listen-in. The clock said exactly 11:50 P.M. C.S.T. A couple of these awful unfiltered A.C. C.W.'s—locals—were frantically scrapping around so I disconnected the loop from the set (for even on a loop some of these fellows bust me badly) and listened without loop antenna or ground. I can hear a good many C.W. stations this way.

The first station was 3AUW calling some 5 at 11:51. Then I tuned down a bit and heard 2FR (I.C.W.) chewing with someone; he didn't call but just signed at 11:52. Then I went back up a little and caught 6XAD with his A.C. plate set signing off—signals about 30 feet from the phone. Then 4GL busted in calling 4FT, rather slower than his usual nervous fist; this at 11:53. Now it occurred to me that I was doing something unusual, and I began to get excited, and began combing up and down the tuner for the rest of the bunch. At 11:54, 9APS and 8ZY, came roaring in. At 11:55, 1XU rattled the phones with his foolish sounding generator, or chopper, or whatever the thing is, and Oh, boy! I began to get wild. The very next thing was 5AAG, C.W., calling an 8. Boy, my heart was in my mouth, here I was with eight stations, one from each district. Now if I got a single duplicate, the whole business was ruined.

It was 11:56 and there was not a seven in sight. I shoved the phones down hard, shut my eyes and held my breath while I wiggled the tuner knob where Kid Hood usually comes in—AND WAS GREETED BY A STEAM CALLIOPE CALLING 9ZAF AND SIGNING WITH THE CALL THAT CLINCHED THE WORKS—7ZO—AT EXACTLY 11:57 P.M.!

"Come Seven!"



Howzat, O.M.? Doesn't that constitute the weirdest piece of luck you ever laid your eyes on? Nine stations copied, nine districts logged, all in seven minutes by the clock, and with no duplicates. I don't think that it has ever been done before and I don't

think that that kind of luck is ever likely to happen again. Guess that's about all I have got to rave over this time. I simply had to tell it to someone and haven't seen a radio man all day so your the goat.

Now to come back to earth; I have written the gang to ask for confirmations on the transmissions, for tho there is no doubt in my mind about the calls, I want to have something to nail on the wall with a big red line around it.

QSL if you get a minute, I am always glad to get a letter with a little red patch in the corner of the envelope; that means it is from one of the gang. Best of 73's.

(Signed) Fred Marco,
9ZN's "FJ".

P.S.:—Remember there is nothing exceptional about hearing this gang. They are all consistent here night after night. The really weird thing about it is the order and the time and getting them without antenna or loop.

FJ.

A Static Eliminator

rt. Hon. mistur ed:

haveing saw in yewr QST ware yew rekwest that sum of us wise end eckspert radeeo engenears kick in with sum gud artikles 2 fill up sed QST, i take grate plesure in complying with yewr rekwest by giving owt sum info. abowt my new static elimonater.



Static Eliminator

"X"

thee idea is to innokulate thee tubes so that thee static will not go threw them. this iz dun bi use of thee simpul cirket showing in the drawing, thee only nessessarey instermints being a tewbe sokit and a spark or cw transformur, abowt 1 kw giveing thee best rezults. i have used this skeem on three tewbes end awl uv them have pruvud hily suksessful, no static being herd on enny of them oweing teu sumthing wich i am werking on now, but haven't figgered owt yet, the felimints of thee innokulated tubes dont seam teu lite and i awlso havent herd enny sigs ovur them yet.

in sineing off, i mite sa that if thee foregoeing artikle finds favur in thee i's of thee hon. ed, i may faver thee gang with another teknickel art. on the "korrekt valyew for a S/R grid cond. in a crystle receevur."

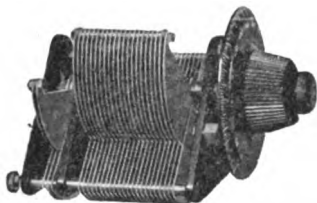
Oscillatingly,
XYZ

J. V. WISE

(Concluded from page 60)

ham—spark coil, spark, and finally C.W.—and most of the time and money he could get ahold of went into radio. As for occupation, he may be classed as a farmer, but Fred Schnell says, "He shoots with both hands and rides anything that grows hair!"

Kellogg Radio Equipment For Better Results

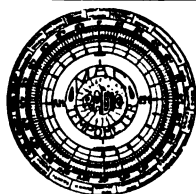


The Kellogg Variable Condenser is of the decremeter type and is unusually well built throughout.

A customer writes: "It's in a class by itself."

- No. 601. 11 plate with 5 plate Vernier. Knob and 4 in. Dial. Each \$6.75
- No. 602. 11 plate without Vernier. Less Knob and Dial. Each 4.50
- No. 603. 23 plate with 5 plate Vernier. Knob and 4 in. Dial. Each 7.75
- No. 604. 23 plate without Vernier. Less Knob and Dial. Each 5.50
- No. 605. 43 plate with 5 plate Vernier. Knob and 4 in. Dial. Each 8.75
- No. 606. 43 plate without Vernier. Less Knob and Dial. Each 6.50

**KELLOGG SWITCHBOARD
& SUPPLY COMPANY
CHICAGO**



You Need This "MAC - RADIO" TEMPOMETER

An accurate, easily operated device by which you can instantly compare the Stand-

ard Time used in all points of the World. An absolute necessity for all radio operators who are receiving either telegraph or phone station schedules throughout the World. IT TELLS YOU WHEN TO LISTEN FOR THAT CONCERT OR MESSAGE. FOR A LIMITED TIME ONLY with each tempometer we will include FREE OF CHARGE our folder giving: Standard Time Meridians of the World, also U.S. time zones and time sending stations, Broadcasting stations of U.S. and Canada with time used by each. Radio Tempometer Price \$1.00. Delivery return mail. Dealers write for discounts.

McCALLUM APPLIANCE CO.
Silver City, New Mexico

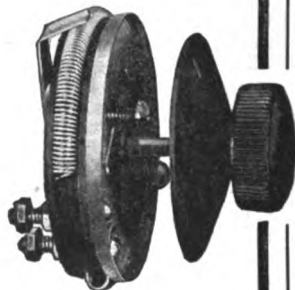
Hear it with

Sterling

The Fine Adjustment Rheostat
Brings Out Everything Clear
and Loud

WHEN working long distance concerts or codes this rheostat makes radio receiving a real pleasure.

The unusually large number of turns give a fine regulation of current. The rheostat is built around a rigid circular supporting frame of nickle plated brass carrying two mounting screws. The contact arm is noticeably smooth running to aid in giving fine adjustments. The Sterling Filament Rheostat is known from coast to coast as representative of the Sterling family of radio devices—especially designed for filament control of detector and amplifying tubes. It will not heat up.



STERLING FILAMENT RHEOSTATS

are used everywhere by commercial and amateur radio users. Adaptable to either panel or table mounting by mere loosening of a set screw.

List Price\$1.00

Other STERLING Radio Devices
Portable Rectifiers
Audio Frequency Amplifying
Transformers
Radio Frequency Amplifying
Transformers
Pocket Voltmeters for testing "B"
Batteries
Filament Ammeters and Volt-
meters.

Over 2½ Million Sterling Devices
in use today

THE STERLING MFG. CO.
2845 Prospect Ave., Cleveland, O.

Burgess, the *Radio* Battery —designed by wireless specialists

It doesn't take long for a radio engineer to tell the difference between a Burgess and an ordinary battery. The Burgess begins to perform at once like a *radio* battery should—and a Burgess *continues* for a longer time.

The reason is that Burgess Radio Batteries are designed, made and sold by *radio* engineers. Burgess didn't rush into the field with merely a collection of flashlight cells. Burgess experimented and perfected the most efficient "B" battery *a long time* before the present popularity of radio began. Don't take our word for it—*ask any radio engineer*.

Leading manufacturers of radio equipment specify "Burgess." Burgess "B" Batteries are handled by all progressive jobbers and dealers. "Look for the Black and White Stripes." And if your dealer doesn't handle Burgess Radio Batteries, just address:

BURGESS BATTERY COMPANY
Engineers — Dry Batteries — Manufacturers

FLASHLIGHT — RADIO — IGNITION — TELEPHONE

General Sales Office: Harris Trust Bldg., Chicago
Laboratories and Works: Madison, Wisconsin

Branches:

New York Boston Washington St. Paul Kansas City New Orleans

In Canada: BURGESS BATTERIES, Ltd.
Winnipeg, Toronto, Montreal

BURGESS

RADIO BATTERIES

"ASK ANY RADIO ENGINEER"





—if you can afford to pay more—you will still prefer CROSLEY efficiency

From the most humble home to the elaborate drawing room, Crosley Instruments are preferred. Regardless of the many higher priced instruments on the market, the man who knows—even if he can afford to pay more—will choose Crosley.

There is no secret in this. Crosley instruments are the acme of efficiency and simplicity and their construction is based on sound fundamental principles. Numerous tests by disinterested parties all over the country will bear us out in this statement.

Your dealer should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

If you are a Jobber or Dealer and do not already handle Crosley Instruments, you will be wise to satisfy the demand that our national advertising has created.

CROSLEY
BETTER · COST LESS
RADIO

Complete sets from \$25 up, all kinds of parts and experimental units.

Write for Catalog

CROSLEY MFG. CO.
118 Alfred St., Cincinnati, Ohio

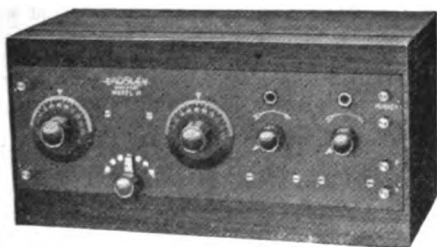
CROSLEY RECEIVER MODEL X. A four tube outfit the same as shown in the above scene. It consists of tuner, one stage of Tuned Radio Frequency Amplification (the feature that has made this set so popular) Detector and two stages of Audio Frequency Amplification in a beautiful mahogany cabinet. It will bring in distant stations loud and clear. With this set, listeners in Florida have heard Winnipeg, San Francisco and Honolulu. Price without phones, batteries or tubes\$55.00

Announcing

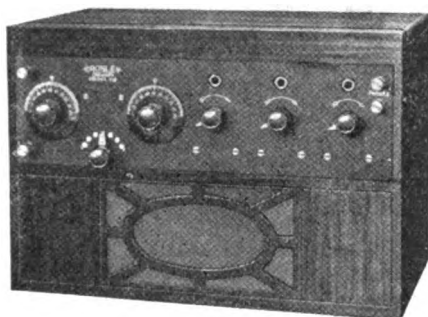
Several New Crosley Units That

will be very Popular

**Three Instruments
made to accommo-
date 1½ volt Tubes**



CROSLEY RECEIVER MODEL VI-S. A two tube set adapted to use 1½ volt dry battery tubes. This is the same as our Model VI but eliminates the use of a storage battery. Consists of one stage of Tuned Radio Frequency Amplification and Detector in mahogany finished cabinet. Price without phones, batteries or tubes \$30.00.



CROSLEY RECEIVER MODEL XII-S A four tube set the same as our Model XV with amplifying chamber. This, however, is constructed to use 1½ volt dry battery tubes and do away with the storage battery. Consists of one stage of Tuned Radio Frequency Amplification and Detector in mahogany finished cabinet. Price without phones, batteries or tubes \$65.00.



CROSLEY RECEIVER MODEL VIII-S. A new three tube set adapted to use 1½ volt dry battery tubes and eliminate storage battery. Consists of one stage of Tuned Radio Frequency Amplification, Detector and one stage of Audio Frequency Amplification in mahogany finished cabinet. Price without phones, batteries or tubes \$50.00.

CROSLEY
Better---Cost Less
RADIO

Your dealer or jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

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CROSLEY MANUFACTURING CO.
118 ALFRED STREET, CINCINNATI, OHIO

Two New *Portable* Instruments



CROSLEY RECEIVER MODEL VI-P. A very light and compact outfit. Designed especially to be carried around without the usual bother of extra batteries, antenna, etc. Consists of a two tube receiver patterned after our Model VI and adapted to use with $1\frac{1}{2}$ volt dry battery tubes. Has compartments for "A" and "B" batteries, aerial and head phones. Made up in neat mahogany finished case. Price without phones, batteries or tubes \$40.00.

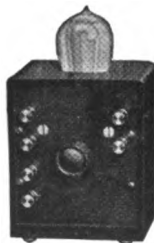


CROSLEY RECEIVER MODEL VIII-P. Another portable Unit the same as that shown on the left but with one added stage of Audio Frequency Amplification. This is the same Receiver as our Model VIII but adapted to use with $1\frac{1}{2}$ volt dry cells and with compartments for all accessories. Especially recommended for long range receiving where one desires to take his instrument from place to place. Price without phones, batteries or tubes \$60.00.

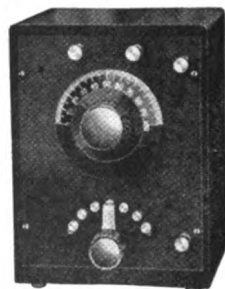
New Units For Experimental Purposes



CROSLEY CONDENSOMETER UNIT. Here we have incorporated a Crosley Model "C" condenser in a mahogany finished cabinet and hard rubber panel with the necessary connections. Can be added to any outfit. Price \$5.00.



CROSLEY DETECTOR UNIT. Consists of socket, Rheostat, grid condenser, leak, etc. with the proper binding post connections. It will add an audion detector to any set. Any standard tube can be used, or with a Crosley adapter, a $1\frac{1}{2}$ volt tube can be used. Price without tube \$4.00.



CROSLEY TUNOMETER UNIT Consists of a vario-coupler mounted in a neat mahogany finished cabinet and hard rubber panel. The primary and secondary are connected to the binding posts. Tap switch furnishes 7 variations of the inductance. Can be used in any hook-up. Price \$7.00.

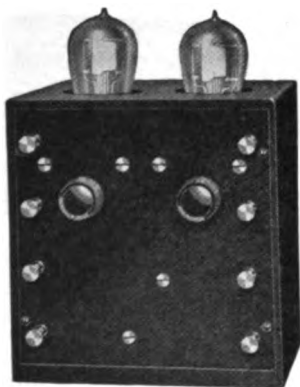
Handled by jobbers and dealers everywhere. If your dealer does not handle Crosley Instruments, send us his name and order direct.

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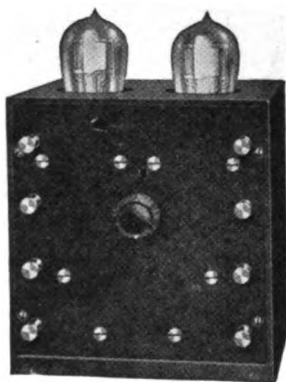
CROSLEY MANUFACTURING CO.

118 ALFRED STREET,

CINCINNATI, OHIO



CROSLY DE-AMPLO-UNIT. Consists of audion detector and one stage amplifier neatly mounted in a mahogany finished cabinet. Crosley standard parts are used throughout including Crosley Sheltran Transformer. All the necessary binding posts are provided to connect up in any hook-up. A very convenient unit to add to a crystal detector set or used in connection with the experimental units shown here. Price without tubes \$11.00.



CROSLY DUO-AMPLO-UNIT. A two stage Audio Frequency Amplifier using genuine Crosley Sheltran Transformers. Unlike some of the more costly units, this amplifier is not resistance coupled, but is the highest type of modern construction. The standard tubes can be used, or, by means of the Crosley adapter, 1½ volt dry cell tubes can be employed. Price without tubes \$14.00.



New Crosley Socket Adapter

Complete with necessary screws and washers. It will fit any standard socket making it possible to use 1½ volt dry battery tube. This is a great boon to those who do not want to use a storage battery. When used with the Crosley V-T Socket, it can be mounted on either panel or base. Price complete \$.70.

Some Notable Price Reductions

CROSLY HARKO SENIOR MODEL V. A unit consisting of tuner, tapped inductance and audion detector that has given wonderful results. One listener in Minnesota hears Schenectady. In beautiful mahogany finished cabinet and formica panel. New price without phones, batteries or tubes, now \$15.00.

CROSLY TWO STEP AUDIO FREQUENCY AMPLIFIER in mahogany finished cabinet and formica panel. Price now \$17.00.

Handled by jobbers and dealers everywhere. If your dealer does not handle Crosley instruments send us his name and order direct.



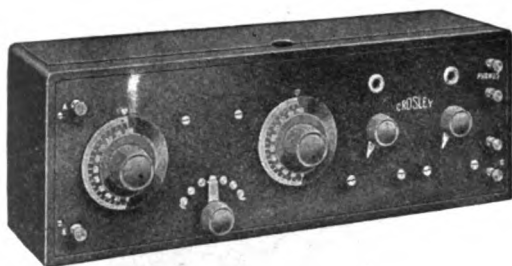
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CROSLY MANUFACTURING CO.

118 Alfred Street,

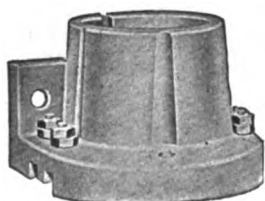
Cincinnati, Ohio



CROSLY MODEL VI. A two tube set similar to the Model "X" shown on the first page. This unit has approximately six times the range and volume of the Harko Senior. It consists of one stage of Radio Frequency Amplification and Audion Detector. It eliminates static to a large extent and distant stations are brought in clear and sharply. New price without tubes, batteries or phones \$28.00.



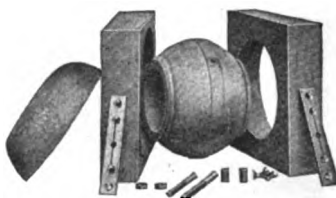
CROSLY RADIO FREQUENCY TUNED AMPLIFIER. Originally designed to be used in connection with the CROSLY HARKO SENIOR MODEL V. Hook ups have now been worked out for its efficient use with Westinghouse, Grebe, Clapp-Eastham and other receiving sets. Complete instructions showing these hook-ups are furnished with each Radio Frequency Amplifier, or will be sent upon request to anyone free of charge. New price \$12.00.



CROSLY V-T SOCKET. This socket has been pronounced by many radio engineers as the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency, service and practical unbreakability. Patents pending. Beware of imitators. Made of porcelain for base, or panel mounting. New price \$.40.

CROSLY VARIOMETER PARTS.

Consists of two stators and one rotor with necessary hardware. Stator can be readily wound with our winding form. Dia. of Rotor 4 in., over all dimensions 3" x 4 1/4". Made of poplar wood, well shellaced. New price \$1.25. Winding form \$.30.

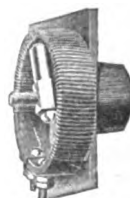


CROSLY VARIO-COUP- LER PARTS.

The CROSLY VARIO-COUP-
LER is made with the same accuracy as the CROSLY VARIOMETER, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and necessary hardware. Complete as shown in illustration ready for assembly—new price \$1.25.



CROSLY RHEOSTAT. Note the new Crosley Rheostat with ball bearing contact. This rheostat permits exceptionally accurate and delicate variations of the filament current. Unique construction allows the CROSLY RHEOSTAT to be mounted on a panel of any thickness up to and including 3/4 inch. New price \$.50.



Handled by jobbers and dealers everywhere. If your dealer does not handle Crosley apparatus, send us his name and order direct.

Write for catalog and leaflets.

CROSLY MANUFACTURING CO.

118 Alfred Street,

Cincinnati, Ohio

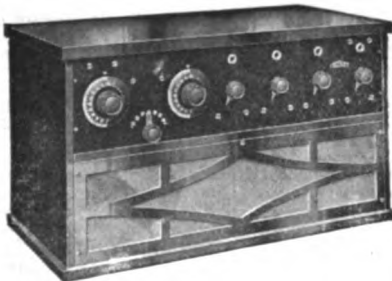
ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Three Beautiful Cabinet Models With the Model X Receiver



CROSLEY MODEL XXV

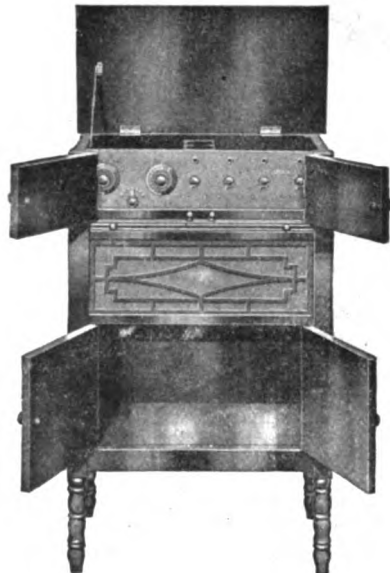
This beautiful mahogany cabinet is equipped with four tube panel incorporating the same units as the Model X. This cabinet is arranged to take the Model R-3 Magnavox that can be quickly installed and hooked up to the set. Cabinet also contains space for "A" Battery, "B" Battery and battery charger if desired. A throw-over switch is provided to change from head phones to loud speaker. It is guaranteed to bring in broadcasting stations up to one thousand miles or more, loud enough to be heard all over the room. This beautiful instrument without tubes, batteries or phones, sells for \$150.00.



CROSLEY MODEL VX

Incorporates the same receiving apparatus as the other instruments on this page. Has special sound resonating chamber but without compartment for batteries. Will fill your room with music or other broadcasting. Mahogany finished. Price without tubes, batteries or phones \$70.00.

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RADIO



CROSLEY MODEL XX

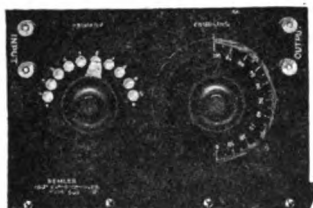
The same as CROSLEY RECEIVER MODEL X in an upright cabinet with special sound resonating chamber. A hinged lid, when raised, allows the operator access to every part of the receiving apparatus. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Has the same volume and range as the MODEL X. Mahogany finished. Price without tubes, batteries or phones \$100.00.

Your dealer or jobber should be able to furnish you with Crosley Instruments. If not, send us his name and order direct.

Send for Catalog

CROSLEY MANUFACTURING CO.
118 Alfred Street, Cincinnati, Ohio

REMLER



Remler Type 505 Panel Mounted
Vario Coupler Price \$12.00



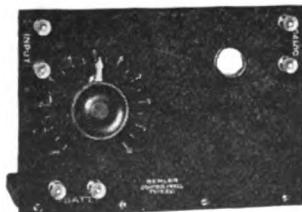
Remler Type 502 Panel Mounted
Variometer Price \$10.50



Remler Type 330 Detector
Panel Price \$8.50



Remler Type 533 Amplifier Panel
less transformer Price \$6.00



Remler Type 331 Amplifier Panel
less transformer Price \$6.00

Remler Panels Make An Ideal, Economical Receiving Set

In placing these panels on the market Remler has put a high quality receiving set within the financial reach of everyone.

When designing these Remler panel-units, Remler engineers combined every point necessary for efficiency in receiving, together with special features of construction for the convenience of the user. No process of manufacturing that would make these panels efficient in operation, beautiful and uniform in appearance has been neglected. Each panel is a complete unit mounted on a hardwood base for table use but so designed that any number of panels may be easily mounted in a single cabinet.

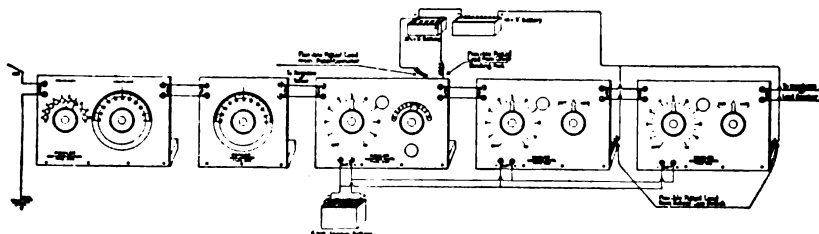
Remler standard parts are used exclusively in their assembly—hence it is possible, by using combinations of Remler panel units, to obtain a complete receiving set, using the same circuit employed in the most expensive receiving set on the market, at only a fraction of the cost.

You can Start with only three panels:

A complete and efficient receiving set for local work is obtained by connecting together Remler panels types 505-502 and 330. For long distance receptions other panels may be added one at a time to suit the convenience of the owner until the most complete and efficient circuit possible is obtained. The cost is nominal.

The diagram below shows five Remler panels connected to form a complete inductively coupled receiving set and two-stage Amplifier.

Send 10c for new Remler 40-page catalog giving prices and complete descriptions of every Remler article.



The Remler Technical Bureau is at your Service. Address your problems to Dept. Q

REMLER RADIO MFG. COMPANY

FACTORY & HOME OFFICE
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EASTERN SALES OFFICE
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Cunningham tubes

Give Clearest Reception

Cunningham Tubes used in any standard receiving set will enable you and your friends to listen to news reports at breakfast, stock market quotations at lunch, and in the evening sit in your comfortable living-room by the fireside and enjoy the finest music and entertainment of the day.

Send 5c for new 32-page Cunningham Tube catalog, containing detailed instruction for the operation of Cunningham Tubes as well as numerous circuit diagrams and graphic illustrations of tube action.

The Cunningham Technical Bureau is at your Service. Address your problems to Dept. Q.

Home Office:—

248 First Street
San Francisco, Calif.

E. J. Cunningham



**AMPLIFIES
AS IT
DETECTS**

PATENT NOTICE

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08 and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

**TYPE C-300
Super-Sensitive
DETECTOR**

\$5.00

**TYPE C-301
Distortionless
AMPLIFIER**

\$6.50



The trade mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

Eastern

Representatives:—

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Chicago, Ill

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of the

THIRD RADIO DISTRICT

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AMERICAN RADIO RELAY LEAGUE

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APRIL 13 and 14—1923

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EXHIBITS BY MANUFACTURERS OF
NATIONAL REPUTATION

TECHNICAL TALKS BY THE COUNTRY'S
MOST PROMINENT MEN IN RADIO

A GRAND REUNION OF THE BOYS WHO
PUSH THE "MIDNITE KEY"

**PRICE OF TICKETS, INCLUDING BANQUET,
TRIP BY WATER TO ANNAPOLIS "NSS"**

\$5.00

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CHARLES F. HENDERSON

2008 BOLTON STREET

BALTIMORE, MARYLAND

**THIS IS YOUR CONVENTION
LET'S GO AND PUT IT OVER**

BIG

ANNOUNCEMENT

Our new Radio Department is now open,
and we can save you money on your
supplies or complete sets.

SPECIALS FOR THIS MONTH

Radiotrons UV200\$4.40
Radiotrons UV201 5.50

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Many other bargains. Price list free.
Try us and be convinced.

C. & E. COMPANY
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"EURACO" PRODUCTS

(Guaranteed)

Compact — Interchangeable

Most Efficient — Accurate:

60
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60
Cents
per
Unit

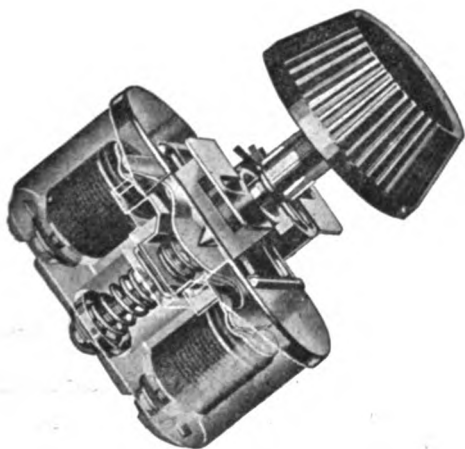
**Mica Condensers — Grid Leaks
Mountings:**

Interesting Proposition for Dealers

EUROPEAN RADIO CO.

1342 East 22nd Street, Brooklyn, N. Y.

The New Bradleystat - a Phenomenal Success



A Phantom View, Showing the Discs

These graphite discs, scientifically prepared, contain the secret of the Bradleystat. No wire rheostat can possibly give the noiseless, smooth control so eagerly sought by radio men. For both 6-volt and 1½-volt tubes, Bradleystat control is unsurpassed.

The discs have no inductance. They last forever, and laboratory tests reveal that they maintain better adjustment than the wire rheostat. Try one, tonight, and enjoy the supreme delight of Perfect Filament Control.

Allen-Bradley Co.
Electric Controlling Apparatus

277 Greenfield Avenue · Milwaukee, Wisconsin

Member of the National Radio Chamber of Commerce

Some Distinctive Features

The new Bradleystat is creating widespread interest among radio enthusiasts. Several refinements in the new model makes the new Bradleystat pre-eminent in the field of filament rheostats.



The new knob, beautifully proportioned and fluted to match the finest radio equipment, distinguishes the new Bradleystat for its splendid appearance. The new porcelain container is smaller than the older model, but the range of control is better than ever.



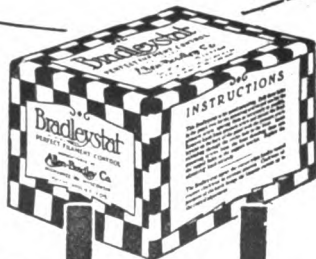
The name, "Bradleystat" is embossed on the new container to protect you against spurious imitations. Safeguard your radio set by insisting on genuine Bradleystats. An adjusting screw has been added in the base for setting the "cut-off" switch as you desire.



Retail Price

\$1.85

P. P. 10c extra



Bradleystat

REGISTERED U. S. PAT. OFF.

PERFECT FILAMENT CONTROL

No Wireless Receiving
set complete without it



PALS AGAIN~ Never a dull evening in the home

WITH the Magnavox Radio, the volume of sound is limited only by the amount of power input.

Magnavox Power Amplifier—Model C (2 or 3 stage) is especially designed for true power amplification, and gives marvelous results.

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc. **\$85.00**

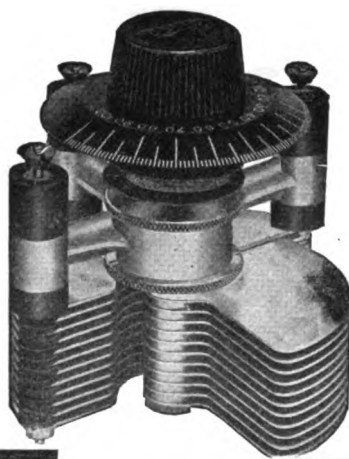
R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc.... **\$45.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio.
2 Stage..... **\$80.00**
3 Stage..... **110.00**

Magnavox products can be had of good dealers everywhere. Write us for copy of new illustrated booklet.

THE MAGNAVOX CO.
Oakland, California
N. Y. Office: 370 Seventh Ave.

MAGNAVOX
Radio
The Reproducer Supreme



Cotoco

TRADE MARK REG. U. S. PAT. OFF.

The Variable Air Condenser that Gets the Best from your Set

Thousands of good sets are giving their owners pitiful results for only one reason, namely inefficient Variable Air Condensers. Did you buy a cheap condenser? Not cheap in price perhaps, but cheaply made; a condenser in looks but not in action. Go to your dealer and ask to see this one. It is as efficient as it is clean cut in appearance. Take it home. Try it. You'll be rewarded.

Insist upon

COTOCO PRODUCTS

**AMPLIFYING TRANSFORMERS FOR
AUDIO FREQUENCY, and
RADIO FREQUENCY
SOCKETS, DIALS
COTOCOILS, THE ORIGINAL
CONCENTRATED INDUCTANCES**

*If your Dealer Fails
you, Write us Direct*

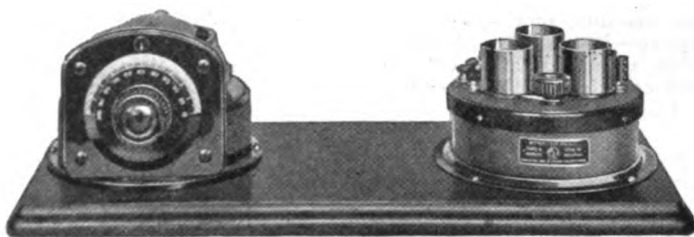
Accept no substitutes. You can't afford to. Ask for Cotoco Quality and get it if you have to write us.

COTO-COIL CO.

87 Willard Ave.,
Providence, R. I.

ATWATER KENT

RADIO RECEIVING SET



THE above set, consisting of Coupled Circuit Tuner and Detector 2-Stage Amplifier, is an ideal set for either phone or loud speaker use. Note that this set includes two stages of audio frequency amplification.

Complete Outfit, as above, wired, \$35.50



The Mounted Variometer carries through the standard quality of ATWATER KENT products. For an open set it supplies a finished instrument unsurpassed in appearance and performance.

Mounted Variometer, \$10.00

ATWATER KENT MANUFACTURING COMPANY

4945 STENTON AVE.

Radio Dept.

PHILADELPHIA, PA.

"We Are Now Signing Off--Good Night!" Now Attach



THE HOMCHARGER

To your AC lamp socket, snap the clips on your storage battery and "turn in." While you sleep, the RADIO HOMCHARGER DE LUXE is silently charging your battery—the charging rate being governed automatically. In the morning it is fully charged; ready for another evening's entertainment, and the cost has

been less than a nickel for current consumed.

No muss, trouble, dirt—no moving of battery—loss of time. You can't connect it up wrong—it can't overcharge nor harm your battery in any way. Its beautiful mahogany and gold finish will harmonize with any living room.

Furnished complete with Ammeter, Attachment Cord and Plug, Charging Cable and Battery Clips, by all good dealers handling radio and electrical equipment, for \$18.50.

Ask your dealer for Bulletin No. 637, illustrating the new HOMCHARGER in actual colors, or write direct.

CAUTION

When buying a Rectifier

insist upon the following:
1—SELF-POLARIZING feature, otherwise your battery may be ruined through reverse charging.
2—AT LEAST FIVE AMPERE CHARGING RATE, otherwise it will require several days to fully charge your battery.

3—UNDERWRITERS' APPROVAL, otherwise in case of fire your insurance may be void.
The HOMCHARGER is the only Rectifier at any price which combines the above, three NECESSARY HOMCHARGING features.

The Automatic Electric Devices Company, 127 West Third St., Cincinnati, Ohio

Largest Manufacturers of Vibrating Rectifiers in the World

HERBERT H. FROST, Inc.

154 WEST LAKE STREET, CHICAGO, ILLINOIS.

FROST-FONES

Super-Inspected Quality Fones and Radio Parts

Frost-Fones are built as precisely as a delicate watch. Specially inspected to insure sensitivity and permanent strength. Frost-Fones excel for hearing local broadcasting stations or distance work.

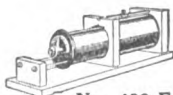
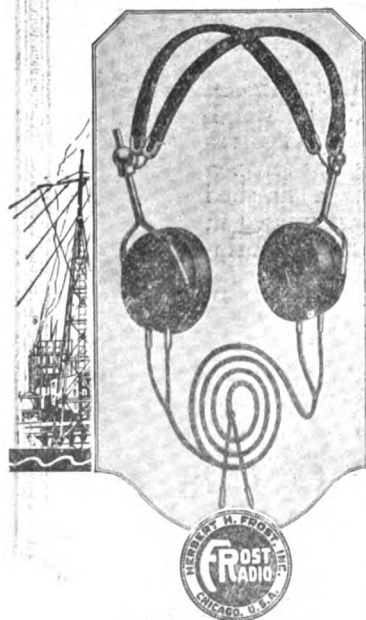
Quantity production and efficient factory methods explain the low price of Frost Quality Fones.

America's leading jobbers and dealers sell Frost-Radio Equipment. Save money and insure satisfaction by insisting on Frost-Radio.

HERBERT H. FROST, Inc.

154 W. Lake Street,

Chicago



No. 400-Frost
Radio Receiving
Transformer,
\$8.50

No. 137—Frost Radio
Cord Tip Plug, \$1.25



No. 131—Frost
Radio Double Cir-
cuit Jack, 90¢.



No. 138—Frost
Radio Multi-
phone Plug,
\$2.50

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

**Q.—What is the most
important thing in
a wireless outfit?**

A.—The wire!

YET we've seen wireless apparatus that seemed almost to take its name literally—as far as having had any serious attention paid to its wire.

Magnet wire is the basic material of radio equipment. For the manufacturer it holds a dual significance. It must perform *economically* in his plant, in the hands of his operators; and it must perform *efficiently* in the finished jobs, in the hands of his customers.

Acme Magnet Wire was made—long before the days of practical radio—to meet these two standards in the field of general electrical manufacturing. It winds easily and economically, because it is uniform, free from imperfections, and its insulation is scientifically applied to insure smooth, rapid production. Its long-continued use by the leading makers of standard electric equipment is ample testimony of its quality in performing the work expected of it.

Acme has pioneered in the development of the finer sizes of enameled magnet wire for radio use and, in winding *hundreds of thousands* of transformer coils in the Acme plant, has gained the practical experience in this field that is of such inestimable value in improving the quality of Acme Wire and maintaining the Acme Service in radio work.

THE ACME WIRE CO., New Haven, Conn.
NEW YORK CHICAGO CLEVELAND

Acme Radio Users

Acme Apparatus Co.
Adams Morgan Co.
Atwater Kent Mfg. Co.
Auth Electrical Specialty Co.
Chicago Telephone Supply Co.
Connecticut Telephone & Electric Co.
Chas. Cory & Son, Inc.
Dictograph Products Co.
Eisemann Magneto Co.
Electrical Products Mfg. Co.
Edwood Electric Co.
Federal Telephone & Telegraph Co.
General Radio Co.
A. C. Gilbert Co.
Holtzer Cabot Electric Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
Standard Transformer Co.
States Co.
Thordarson Mfg. Co.
Wells Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Acme Electrical Insulations

Flexible varnished tubing in all sizes and colors; standard or special.

Acme Radio Specialties

Audio Transformer windings.
Radio Frequency windings.
Magnet windings for Head Sets.
Enameled wire—especially the finest sizes, 40-44 B & S gauge.
Silk and cotton-covered magnet wire.
Enameled Aerial wire—single wire and stranded.

Acme Wire Products

"Enamelite," plain enameled Magnet Wire; "Cottonite," Cotton-covered Enamelite; "Silkenite," Silk-covered Enamelite; Single and Double Cotton Magnet Wire; Single and Double Silk Magnet Wire. We also have a complete organization for the winding of coils in large production quantities.

Illustrated Catalog will be sent upon request to Purchasing Agents and Engineers.

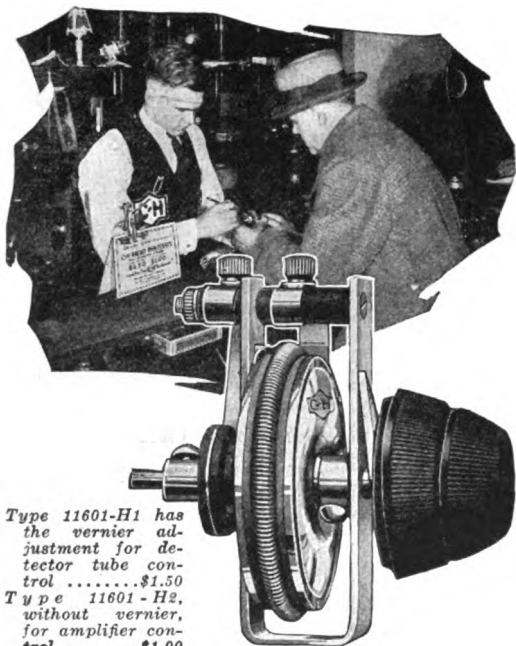


Acme Wire

"It goes in the space"

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

95



Type 11601-H1 has the vernier adjustment for detector tube control\$1.50
Type 11601-H2, without vernier, for amplifier control\$1.00

Dealers Point with Pride to the C-H Trade-mark

One of the first things any dealer will point out in showing you a genuine Cutler-Hammer Radio Rheostat is the famous C-H trade-mark engraved in the satin-nickel body.

As a practical electrical man, the dealer knows the protection this trade-mark gives the buyer—he knows that “radio rheostats built by rheostat builders” means perfection as the result of years of experience, not hasty design to meet a sudden demand.

For more than a quarter of a century the engineers of Cutler-Hammer have been the aggressive pioneers in the development of rheostatic control, and their signature of approval—the C-H trade-mark—is known and respected in every industry the world over.

The dealer is proud to show, as representative of his stock, these rheostats of recognized and guaranteed quality, and he recommends them with full confidence, knowing that they were designed by specialists to give you unflinching satisfaction.

THE CUTLER-HAMMER MFG. CO.
MILWAUKEE - WISCONSIN

Over a Quarter Million in Use

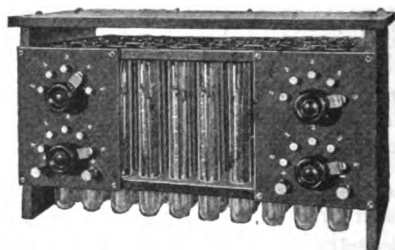
CH RADIO RHEOSTATS
“BUILT BY RHEOSTAT BUILDERS”

“Member, Radio Section, Associated Manufacturers of Electrical Supplies.”



“B” Battery with Panel Control

Storage Batteries designed for RADIO



KICO Storage “B” batteries are used by thousands of amateurs who understand radio and consequently buy nothing but the most efficient equipment.

A FEW REASONS

1. Alkaline type. Unlimited Life.
2. They eliminate noises caused from “Bs” that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A. C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries sold with the privilege of receiving your money back if unsatisfied within a 90 day trial.
7. Neat, Efficient and Compact.

		(Plain)	(With Panels)
16 cell	22 volts	\$6.50	
24 cell	32 volts	8.00	\$12.00
36 cell	48 volts	10.00	14.00
50 cell	68 volts	12.00	17.00
78 cell	100 volts	16.00	21.00
108 cell	145 volts	21.00	26.00

F.O.B. Buffalo, N. Y.

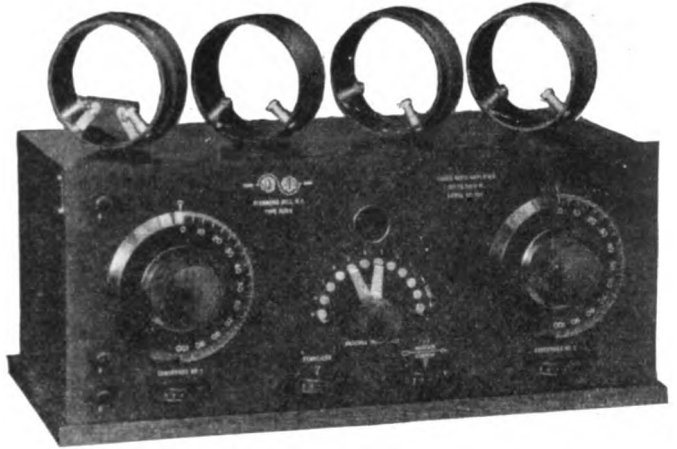
Literature gladly furnished

We distribute KING Chargers

KIMLEY ELECTRIC CO.

1355 Fillmore Ave., Buffalo, N. Y.

Ready for Delivery New **GREBE RORN Amplifier** **\$60⁰⁰**



This new **tuned R. F. Amplifier** equals two steps of audio frequency amplification, entirely eliminates QRM and will bring in stations you never heard before.

Perfectly designed for use with Grebe CR-3, CR-5, CR-8 and CR-9 receivers,—four inductances covering range of 150-3000 meters. Gives splendid results with other standard receivers or with your home-built outfit. Conservative range 500 miles used with loop aerial, detector and one amplifier tube.

Booklet with each RORN shows in detail how to connect to all types of receivers. Requires one amplifier tube and 90-volt B. battery for operation.

Price complete with four inductances, \$60. Immediate delivery on mail orders.

BEST SELLERS

New Magnavox-copper horn	\$45.00
Fada Varie-Couplers.....	4.75
Klosner Vernier Rheostats...	1.80
Acme Pot-Rheo.....	3.00
DeForest D-7 Reflex Set.....	112.00
Single Baldys-Type "C".....	7.75
WD-11 Tubes 1.5-V Filament	6.50
Sockets for above.....	.75
Adapters for standard base...	1.50
Amrad Broadcast Receiver.....	125.00
Gold Grain Detectors.....	2.50
For panel mounting.....	2.00
Reinartz Tuner Coils.....	2.00
Amrad 2-step Amplifier.....	40.00

New Year's Gift

Bakelite VT socket free with each vacuum tube sold during January.

CHICAGO ARRL MEN can always find the latest apparatus and most courteous service at "Radio Center."

DX MEN—we offer you the same service by mail. Try us for items listed or any **NATIONALLY ADVERTISED EQUIPMENT**.

LYNN RADIO COMPANY

STANDARD NATIONALLY ADVERTISED

Phone Harrison 7293 RADIO EQUIPMENT L. L. Lynn, Pres.

Sixth Floor Consumers Building
220 South State St — Chicago, Ill

For Best Super-Regenerative Results

Use Coils Armstrong Chose



PACENT DUO-LATERAL COILS

The Last Word in
INDUCTANCES

For the Armstrong Super-
regenerative circuit.

Size	Price
US 400 Unmounted.....	\$1.20
US 1250 Unmounted.....	2.70
US 1500 Unmounted.....	3.20

Don't Improvise
PACENTIZE

Major Armstrong selected PACENT Duo-Lateral Coils as the best to use in his original super-regenerative equipment. Other leading authorities endorse his selection. Genuine Duo-Lateral Coils are distinguished by their characteristic staggered winding, are labeled "DUO-LATERAL COIL" and marked "Patented June 1920."

Send for Descriptive Bulletin (Q.J.102)

PACENT ELECTRIC COMPANY

INCORPORATED

Manufacturers & Distributors of Radio & Electrical Essentials

Executive Offices: 22 Park Place, New York, N. Y.

BRANCH OFFICES

Philadelphia, Bourse Bldg.
Chicago, 33 So. Clinton St.

Wash., D. C., Munsey Bldg.
San Francisco, Sheldon Bldg.

Members, Radio Section,
Associated Mfrs. of Electrical Supplies



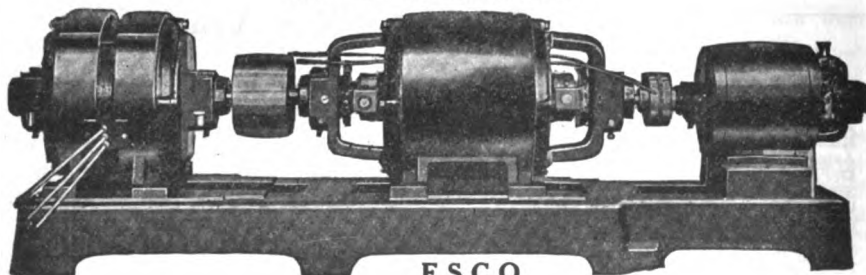
Can. and British Licensees:
COLONIAL RADIO, Ltd.,
Hamilton, Canada

ESCO

TRADE

MARK

QUALITY ALWAYS HAS BEEN, AND ALWAYS WILL BE, THE WORLD'S
SAFEST INVESTMENT



ESCO

HIGH VOLTAGE MOTOR-GENERATORS STAND PRE-EMINENT

Used by Leading Educational Institutions, U. S. Army and Navy Academies, Research Laboratories.

Newspapers, Dept. Stores and Broadcasting Stations.

BULLETIN 237 LISTS OVER 200 COMBINATIONS

Special Apparatus Developed for Special Requirements

MOTORS—DYNAMOTORS—GENERATORS—MOTOR-GENERATORS

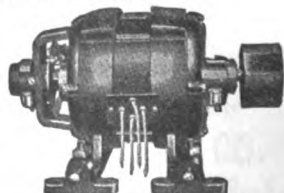
Sold by Principal Dealers Everywhere



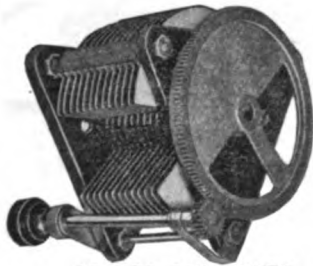
Electric Specialty Co.

215 South Street

Stamford, Conn., U.S.A.



A.R.R.L. ANNOUNCEMENT



GEARED CONDENSER



POWER AMPLIFIER

The General Radio Company has been supplying the needs of the experimenter for nearly a decade. It antedates QST and the A.R.R.L. Since the formation of the A.R.R.L. this Company has used QST to announce whatever new radio instruments it has produced. Several new instruments have just been developed that are now ready for the experimenter. They are so new that we have not obtained the advertising cuts as yet. Here is a list of them:

TYPE 300-A AMPLIFIER UNIT

A compact unit consisting of our Type 231-A Amplifying Transformer, Type 255 Filament Rheostat and Type 282 WD-11 Tube Socket mounted on a nickel finished brass mounting. These parts are all wired ready for the external connections. The mounting is so designed that the unit may be used on a table or mounted behind a panel with only the rheostat knob projecting.

PRICE, COMPLETE\$7.50

TYPE 282 WD-11 TUBE SOCKET

A socket of moulded bakelite arranged with positive contact springs to take the WD-11 tubes. This is a socket in itself, not an adaptor.

PRICE80 cents

TYPE 255 RHEOSTAT

A rheostat of moulded bakelite, not a substitute, for panel or table mounting. Smooth in operation and attractive in appearance. Resistance 6 ohms; current carrying capacity 1.25 amperes.

PRICE\$1.00

TYPE 272 POWER AMPLIFIER

A two stage amplifier for use with loud speakers. Operates from 110 volt A.C. lighting supply. Uses power tubes and requires no storage battery.

PRICE\$40.00

TYPE 247 CONDENSERS

These already popular condensers may now be equipped with gear providing a vernier adjustment with but a single setting. A low loss condenser with a micrometer adjustment. Made in 8 types.

PRICE\$3.25 to \$7.75

Send for NEW FREE RADIO BULLETIN 912Q and learn about these instruments.

GENERAL RADIO COMPANY

MASSACHUSETTS AVENUE AND WINDSOR STREET

CAMBRIDGE 39

MASSACHUSETTS

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

Standardize on General Radio Equipment Throughout

Regenerative
RadioCraft
Radiophone*
Type D-4

A compact and efficient Receiver that looks good and works better!



The Principle is only Half the Battle

YES, it's regenerative. But there's one other point you want to know. What parts make it up? De Forest parts go into RadioCraft sets—and that tells the whole story. Here is regenerative equipment inexpensive in price and so efficient that it will bring in broadcast within a radius of 150 miles and upward. D-4 is designed for the user who wants a compact portable outfit for camping or touring. It is also ideal for the family which desires to purchase a tuner and detector unit, and after becoming accustomed to its use adding the 2-Step Amplifier, D-5, shown below, for the purpose of actuating a loud speaker. The two units are so designed, being exactly of the same size, that they can be placed

one beside the other and connections made by means of short wires.

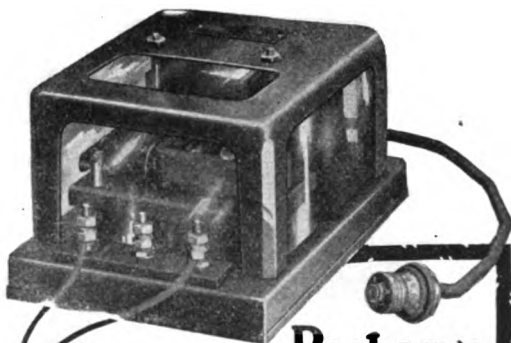
De Forest dealers carry RadioCraft Regenerative equipment.



RadioCraft
Radiophone*
2-Step Amplifier
Type D-5

* By permission of
De Forest Radio Tel. & Tel. Co.

The RadioCraft Co., Inc.
139 Franklin St., Jersey City, N. J.



Recharge Your Battery at Home

Charges both A and B Radio Batteries

Don't be without the use of your Radio Receiving Set while your battery is being charged. Get a Valley Charger and charge your battery right at home.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge it or harm it in any way.

Will charge the A 6 volt battery at a 5 ampere rate, and the B 22½ volt battery at the required ½ ampere rate. 45 volt B batteries may be connected in parallel so that they can also be charged.

SATISFACTION GUARANTEED.

If your local distributor cannot supply you, write direct to

VALLEY ELECTRIC COMPANY
Department Q, ST. LOUIS

- - - Mail the Coupon - - -
Valley Electric Co., Dept. Q, St. Louis, Mo.

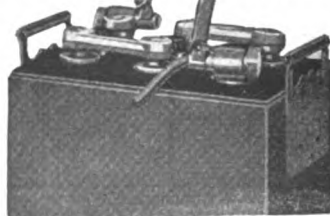
Gentlemen: I am enclosing money order (or check) for \$18.00, for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory I will return it and get my money

Name _____

Address _____

\$18.00

F.O.B. St. Louis





This Panel Will Improve Your Set

CONDENSITE CELORON

The best panel made is none too good for your set. Dependable insulation is vital because it has a direct bearing upon the clearness and sensitivity of both transmission and reception.

Every thinking radio enthusiast certainly wants the highest type panel he can obtain and the surest way to get it is to insist upon Condensite Celoron.

This strong, handsome, jet-black material is not merely an insulating material—it is a radio insulation made to meet high voltages at radio frequencies. That is why it will give you greater resistivity and a higher dielectric strength than you will ever need.

Make your next panel of Condensite Celoron. It machines readily, engraves with clean cut characters and takes a beautiful polish or a rich dull mat surface.

An Opportunity for Radio Dealers

Condensite Celoron Radio Panels and Parts offer a clean cut opportunity to the dealer who is keen on building business on a quality basis. Write us today. Let us send you the facts. You'll be interested.

Diamond State Fibre Company
Bridgeport (near Philadelphia), Penna.
 Branch Factory and Warehouse, Chicago.

Offices in Principal Cities

In Canada: Diamond State Fibre Co. of Canada, Toronto, 245 Carlaw Ave.



Radio Frequency Amplifying Transformers

200-600 METERS—AIR CORE

Made by Foremost Amplification Experts



Three Types

Type T-11 for the first stage. **\$6.00**

Type T-11A for the second stage. **\$6.50**

Type T-11B for the third stage. **\$7.00**

The best recommendation of Mu-Rad Radio Frequency Transformers is their use in Mu-Rad Receivers. When you listen in with a Mu-Rad Set, you appreciate the difference this greatly superior transformer makes.

No iron losses, capacity effects and eddy current loss. Wonderfully accurate, performance varies less than a half of one per cent. Designed by amplification specialists. Admittedly the best.

Write for comprehensive leaflet on Mu-Rad R. F. Amplifying Transformers and Mu-Rad Receivers. Well worth the effort. Do it NOW! Sold by all GOOD radio stores and departments.

MU-RAD LABORATORIES, Inc.

804 FIFTH AVE.,

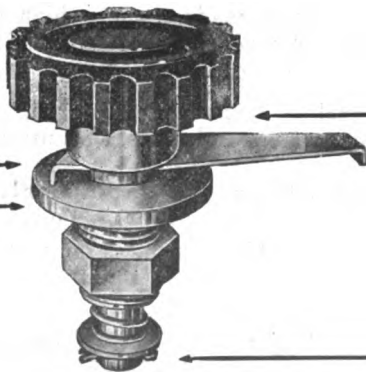
ASBURY PARK, N. J.

Already Hundreds in Use!

The Ace type LS panel lever switch has met with immediate popular favor all over the country. The reason is its many exclusive features as shown. Polished nickel plated finish—postpaid for 65 cents.

*Perfect Self
Cleaning Wipe
Contacts.*

*Generous Contact
Surface.*



*Hard Rubber
Knob Molded-in
HEXAGONAL
Shaft-Blade
CANNOT turn.*

*Perfect Self
Cleaning Wipe
Contacts.*

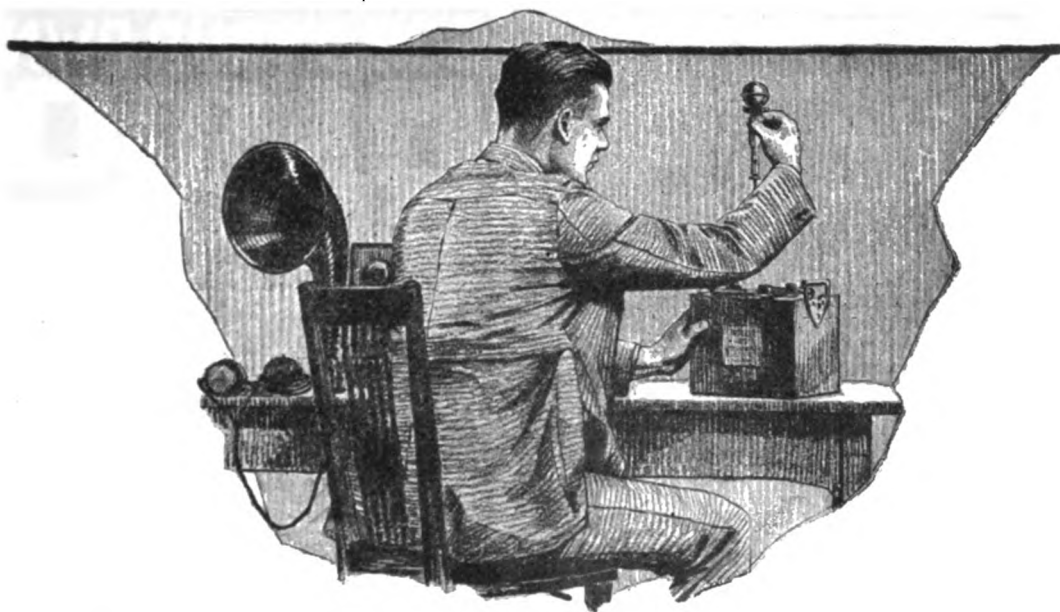
*Spring and Cot-
ter Pin Lock—
No Nuts to Work
Loose.*

Dept. Q

THE PRECISION EQUIPMENT COMPANY

2437-39 GILBERT AVENUE,

CINCINNATI, OHIO



Tungar

Your Battery

Should be Kept Fit



This enables you to keep batteries fit, right at home. With simple attachment, it will also charge "B" storage batteries.



This is the way "B" Storage Batteries are charged with Tungar and attachment.

The Tungar Battery Charger makes it a simple matter to keep your storage battery tuned-up and fit. With it you can recharge your battery at home—and at little cost.

Tungar is a small, compact rectifier, which can be connected with any a-c. lighting circuit. It is easy and safe to operate—in fact, requires no attention after starting. And when properly connected, the current can go only the one way, eliminating any danger of ruining the battery.

There is no excuse for allowing your battery to run down and spoil the evening's fun. A Tungar doesn't cost much—and it charges the starting and lighting battery in your automobile also.

Send for our new booklet on Tungars for radio, if your dealer cannot supply you.

Address Merchandise Dept., General Electric Company, Bridgeport, Conn.

General Electric Company

General Office
Schenectady, N.Y.

Sales Offices in
all large cities 35A-78C

he Standard Idea

An Old Firm With a New Policy

On and after November 1st "Standard" apparatus will be sold only direct from the manufacturer and the following reduced prices will be in effect:

A BIG SAVING ON EQUIPMENT

Multiple Wave Tuner...\$30.00
(former price \$45.00)

Short Wave Tuner.....\$23.50
(former price \$47.00)

**Detector and Two Stage
Amplifier\$35.00**
(former price \$49.00)

The foregoing is but a partial list of the items manufactured and distributed by us.

The apparatus is not changed in any way, carries the same guarantee and is sold on the same terms, namely one third cash with order and balance C.O.D. after examination at your express office.

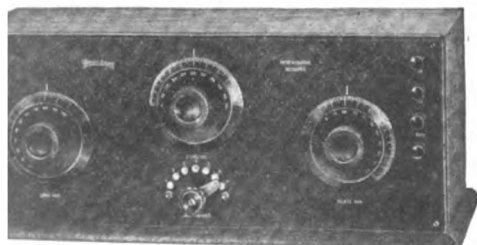
Write for booklet "The Standard Plan" showing how you can obtain quality apparatus at a price within your means.

Watch for our new line of "Novice Type" instruments.

**STANDARD ASSEMBLING
COMPANY**

3 Stone St.

New York, N. Y.



BUILD YOUR OWN RADIO

The Radio Specialty Company—RASCO for short—specializes in small orders; in fact, 50% of our orders are less than one dollar. 24-hour service guaranteed.

This Company specializes in small parts for radio, selling only the highest class of materials. This Company is aware of the fact that very high prices prevail in radio now. By buying material from us you not only save anywhere from 50 to 75% on the cost of the instruments, but you have the fun and instruction of making them yourself.

Our quick, 24-hour service means satisfied customers. We have no Complaint Department. Hundreds of letters such as the following, unsolicited, are in our files:

41 Rodney St., W. St. John, N.B.
Dear Sirs:

Enclosed you will find one (1) dollar for which please send me 1 dozen binding posts No. 201 at \$1.00 per dozen and oblige.

Geo. B. Ingraham
P.S.—Rasco Service is sure all it is cracked up to be. I have received three different orders from Rasco and I am still waiting for an order from another Company which was sent in before the first Rasco order.

Yours truly, 64 page catalog
G. B. I.

Our prices are low and all goods are shipped prepaid. You deal with the oldest and only Company exclusively manufacturing the small parts in their own two big factories. Our big 64-page catalog, No. 7, containing over 300 illustrations will save you money. This catalog also contains

75 Diagrams of Vacuum Tube Hook-Ups

not to be found in any catalog, only found in expensive text books. This catalog sent only upon receipt of 15¢. Once you have tried the RASCO service you are a customer for life. 85% of our customers always come back.

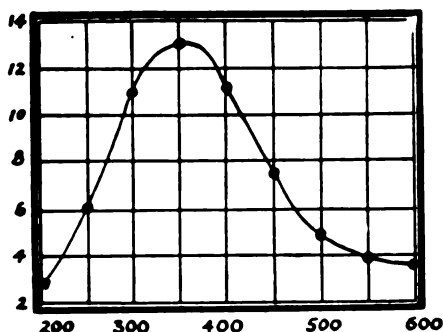


Detector
50c

Radio Specialty Co.

98-100 PARK PLAGE, NEW YORK CITY

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS



Find this out

Before you choose your radio frequency transformer

DOES it have marked depressions and peaks in its amplification range curve between 200 and 500 meters (indicating absence of amplification at the depressions)—or does it keep the amplification range curve uniform with its maximum efficiency around 360 meters—the place you need it most.

A test

THE two charts above tell a graphic story of tests made on radio frequency transformers in the laboratories of a well known concern. The chart at the left plots the amplification range curve of an Acme R-2 taken from stock. The chart at the right represents a composite plot of the curves of 6 ordinary types of different makes taken from stock. The superiority of the Acme R-2 is self evident. Note its steadily increasing amplification curve with its maximum at 360 meters—just where it is most needed.



ACME R-2 Radio Frequency Amplifying Transformer.
Price \$5.00 (East of Rocky Mts.)

Getting greater distances

EQUALLY important is the greater distances over which you can get broadcasting when using the Acme R-2. The R-2 used in a radio frequency amplifier builds up wave energy before passing it on to the detector. You hear signals that would ordinarily be inaudible. Even the simplest and most elementary type of set, either vacuum tube or crystal receiver type, will have its range tremendously increased when the Acme R-2 is employed in conjunction with a vacuum tube.

The best method

TO SECURE maximum results over long distances use both Acme Radio and Acme Audio Frequency Transformers. This insures maximum sensitivity and intensity, quietness in operation and freedom from distortion. A small indoor antenna or loop may be used and sufficient intensity obtained to operate the Acme Kleerspeaker, providing perfect entertainment for a roomful of people.

You can get these and all other Acme Products at radio, electrical and many hardware stores. Write for booklet R-2 showing proper hook-ups and other information.

THE ACME APPARATUS COMPANY, Cambridge, Mass.

Pioneer transformer and radio engineers and manufacturers
NEW YORK, 1270 Broadway

ACME

~ for amplification

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Trade Mark
Registered

GREBE distributors in Eastern Pennsylvania, Southern New Jersey, Delaware and Maryland. The Famous Grebe Receivers are renowned for their sensitivity and expert workmanship.

We carry complete stocks of R. C. A. Products and others of merit.

Have your dealer order from us for immediate Shipment.

PHILADELPHIA WIRELESS SALES CORPORATION

Formerly Philadelphia School of Wireless Telegraphy

**1533 PINE STREET,
WHOLESALE DEPT.**

**1326 ARCH ST., PHILADELPHIA
RETAIL DEPT.**



RADIO TRANSFORMERS

An unusual Radio Frequency Transformer with an adjustable Silicon core—an exclusive patented feature, enabling reception at 200 meters as well as on the higher wave lengths. Daily establishing DX records. Price only \$4.50



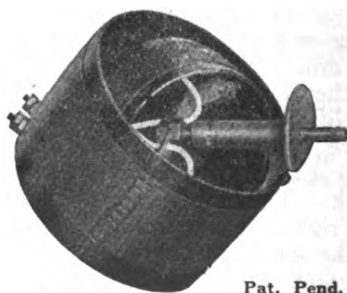
**DONGAN ELECTRIC MFG. CO.
DETROIT MICHIGAN**



An amplifying transformer scientifically constructed to bring out full, clear tones. Top or side panel mounting. Price \$4.00.

LORAIN

**The Coupler with the
PERFECT MOUNTING**



Pat. Pend.

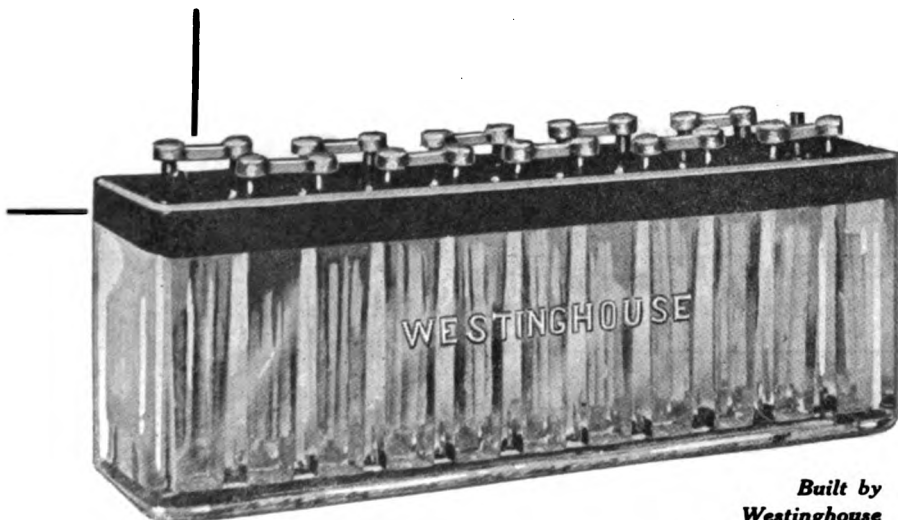
A coupler which is fast proving its superiority. A coupler designed to work correctly and give lasting satisfaction. Accept no substitute.

Price \$5.50

Send for complete description. Circular C.2.

If your dealer cannot supply you write us and send his name. Dealers write for discounts.

**Lorain Radio Supply Co.
LORAIN, OHIO**



*Built by
Westinghouse
—you know it's right*

THIS newest Westinghouse Radio "B" Battery is a 22-volt, glass-case baby storage battery that is a marvel for steady, noiseless, full-powered service. Lasts indefinitely because it can be recharged repeatedly—making it not only the most satisfactory, but ultimately the most economical type of "B" battery. Sold by radio dealers, and also by more than 2000 Westinghouse Battery Service Stations.

WESTINGHOUSE "A" BATTERIES. Ten sizes—27 to 162 ampere-hours' capacity; 4, 6 and 8 volts. Slow-discharge, long-life batteries built especially for radio work.

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

WESTINGHOUSE

RADIO "A" and "B"

BATTERIES



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ROCK BOTTOM PRICES

LOOK OVER THIS LIST

Send Us Your Order With Money Order—
Including Transportation

WE WILL SHIP AT ONCE

Lamb Products Are Guaranteed

DESCRIPTION	OUR SPECIAL PRICES
WD-11 Adapter (Fits Radiotron sockets) .. ea.	\$1.00
WD-11 Aeriotron Socket	
Style A—for Base Mounting	.50
Style B—for Bracket Mounting	.60
Polished Nickel Tube Socket Single	.50
Polished Nickel Tube Socket Double	.85
Polished Nickel Tube Socket Triple	1.25
Bezels (Screen windows)	.20
Contact Points with 1 nut	.25
Instrument Switch & Points complete ..	1.00
Switch Levers	.35
Nickel Binding Posts	.35
Composition Cap Nickel Base Binding Posts (large size)	.60
Composition Cap Nickel Binding Posts (small size)	.50
LAMB 43-Plate Condenser (.001 M.F.) ..	2.45
LAMB 25-Plate Condenser (.0005 M.F.) ..	2.20
LAMB 11-Plate Condenser (.00025 M.F.) ..	1.90
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Tuning Coil with two (2) Sliders	2.75
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Crystal Detector (Glass Tube)	.75
1" or 1/4" Sliders	.15
1" or 1/2" Rods	.12
3" Genuine Bakelite Dials	.50
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Telephone Jacks	.50
Cutler-Hammer Rheostats	.90
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LAMB TW Tuners	40.00
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Grebe CR-9 Receiving Sets	110.00
Westinghouse RA-DA Receiving Sets	100.00
Clapp-Eastham HR Receivers	25.00
DeForest Radiohome Receivers	20.00

We are Manufacturers and Jobbers of Radio equipment and accessories. If your dealer does not offer you LAMB Radio products, send us your orders direct. We GUARANTEE OUR PRODUCTS and we ship goods the day your order is received.

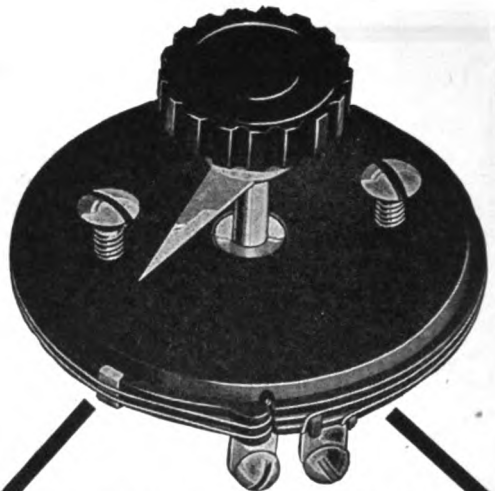
F. JOS. LAMB CO.

RADIO EQUIPMENT

DETROIT,

MICHIGAN

1938 FRANKLIN ST.

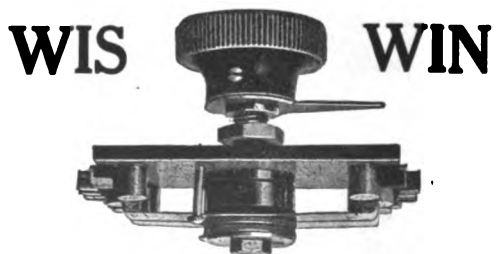


VERNIER RHEOSTAT

The Jewell vernier rheostat is extremely simple and substantial in construction, employing a new principle of contact which we have patented. Made of the highest grade bakelite and using the best resistance wire obtainable. Very fine adjustments are obtained by a single turn of the knob. Ask your dealer or write to us for special circular.

PRICE \$1.00

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago



No. 764 SERIES PARALLEL

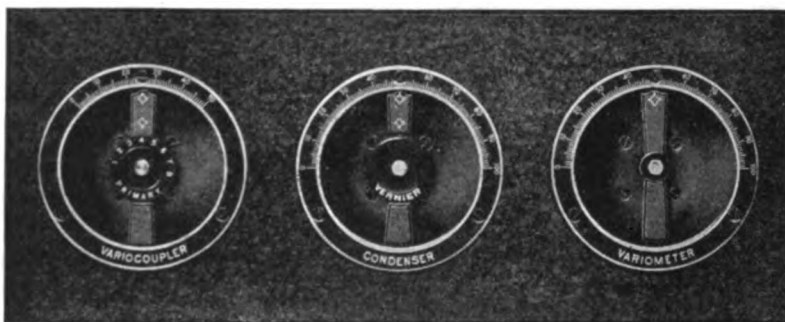
Concealed type, mounted on formica base, \$1.50. No. 754 visible type, switch alone, 65c.

Our sheet of diagrams showing the many uses of this popular switch sent free upon request.

Willis Switch & Instrument Co.
8 Kingsbury St., Jamestown, N. Y.



Why Not Use Metal Panels in Radio Sets?



This question is constantly being raised and the solution is to be found in the use of Eisemann units. By reason of their complete self-insulation, they may be used on panels of metal, wood or any other material without introducing electrical losses. The concave dial itself serves as an adequate shield.

The illustration above shows

the attractive appearance of Eisemann parts when mounted. The control bar fits the hand and is ideally adapted for fine adjusting.

The absence of protruding knobs and dials, together with the many advanced features of design and excellent electrical characteristics, commend Eisemann parts to discriminating buyers everywhere.

Write for descriptive folders

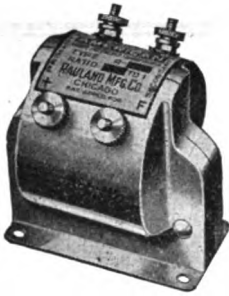
EISEMANN MAGNETO CORPORATION

William N. Shaw, President

BROOKLYN, N. Y.

DETROIT

CHICAGO



“All American”

Audio and Radio Frequency Amplifying Transformers Are 100% Good



That's the verdict of seasoned radio experts who have dealt with this responsible house for years.

Our **RADIO-Frequency Transformer** (Type R-10—150 to 550 meter wave-length) strengthens weak signals many-fold; gives clear sharp definition; largely eliminates static and other disturbances.

Our **AUDIO-Frequency Transformers** give such powerful amplification that signals which could otherwise be heard only thru headphones come in clear and strong thru any good loudspeaker.

LIST PRICES

R-10—Radio Frequency (150-550 meters).....	\$4.50
R-12—Audio Frequency (Ratio 3 to 1).....	4.50
R-13—Audio Frequency (Ratio 10 to 1).....	4.75
R-21—Audio Frequency (Ratio 5 to 1).....	4.75

Send for Bulletin No. 22. It explains the technical and mechanical reasons for the splendid performance of “All American” Amplifying Transformers. When you send for it, please give name and address of the Radio Dealer thru whom you prefer to buy. Don't let anybody sell you a Radio outfit at any price, with any other than “All American” Transformers.



RAULAND MFG. Co.
35 So. Dearborn St., Chicago, Ill.



Yours - get it!

—a free copy of “Chi-Rad’s” 1923 loose leaf handbook.

With “Chi-Rad” a distributor for more than 21 leading radio manufacturers this catalog will be a comprehensive review of most of the noteworthy radio parts of recent manufacture. You will find it a big help in selecting those radio parts for that set you are building.

Because of expected additions only a limited number of catalogs have been published. Be sure to get your copy—send the coupon for it now!

Chicago Radio Apparatus Co.
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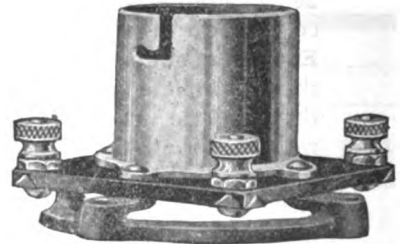
Gentlemen:—Please send me, without obligation, a free copy of your 1923 catalog. 105

Name.....

Address.....

City.....State.....

New V. T. Socket Illinois Cushion-Resilient



(Pts. Pend.)

This final improvement in Vacuum Tube Sockets is to *protect your vacuum tube from vibrations and shocks*, which cause distortions and many of the noises in phones, especially when amplified.

Furthermore, a sudden jar or shock has caused the parting of many an incandescent filament—*Save yours from this danger.*

The best authorities recommend Cushion-Resilient mounting and the most particular manufacturers use a mounting of this nature in their sets.

Bakelite base mounted on live rubber moulded ring sub-base, not in contact with electrical conductors. Long smooth-acting sure-contact springs. Metal parts N.P. Price \$1.00. Bracket for direct panel mounting 25¢. Ask Dealers or write direct to manufacturers for circular 8.

ILLINOIS RADIO CO.
Springfield, Illinois



The favorite—from coast to coast

EVERYWHERE you will find up-to-date radio men who have taken the trouble to test all the various radio materials expressing a preference for Formica.

They like its beautiful finish. They like the wonderful uniformity of its dielectric strength. They like the way it works with ordinary tools. Many of them will show you high power, high frequency sets in which Formica panels and tubes have been used for years—and always given perfect service.

The preference for Formica is not confined to any one class. Manufacturers of the highest grade apparatus use it; so do skillful amateurs, and dealers everywhere prefer to sell it because of its high standing with their trade.

Formica is approved by the navy and the signal corps, and by the great majority of active radio men. Be sure to ask for it by name.

DEALERS: Formica cooperation with the dealer is complete and willing. We supply literature, counter cards, plates for advertisements. Our large capacity makes immediate delivery possible on all orders.

THE FORMICA INSULATION COMPANY
4620 Spring Grove Ave.,
Cincinnati, Ohio

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415 Ohio Building, Toledo, Ohio

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313 Title Building, Baltimore, Md.

422 First Avenue, Pittsburgh, Pa.
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Sheldon Bldg., San Francisco, Cal.

FORMICA

A Laminated Phenolic Condensation Product
SHEETS TUBES RODS

POSACO

RADIO

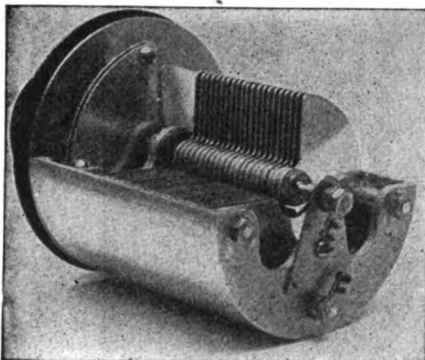
QUALITY AND EFFICIENCY

VERNIER CONDENSER WITH SINGLE KNOB CONTROL

Especially Adapted to the New Armstrong Super-Regenerative Circuits in which Variable Condensers play an important part and in which fine adjustments are Absolutely Essential.

B-1 .001015 MFD. \$7.50
B-2 .000545 MFD. \$7.00
B-3 .000295 MFD. \$6.50

Constructed With the Same High Standard of Quality in Materials, Workmanship and Design as Our Regular Variable.



NEW MODEL. Improved Construction and Design. Gives Maximum Rigidity, Thus Insuring Permanence of Alignment and High Efficiency in Operation.

A-1 .001 MFD. \$4.50
A-2 .0005 MFD. \$4.00
A-3 .00025 MFD. \$3.50
A-4 .000045 MFD. \$3.00

Ask Your Dealer or Write for Circular.
Jobbers and Dealers Write for Proposition.
Increase Your Sales.

—MANUFACTURED BY—

Alden L. McMurtry, Licensee

THE C. D. POTTER CO.,

Stamford, Connecticut

POSACO

RADIO

Amazingly Clear!

—is amateur's or expert's verdict when speaking of Elwood Phones. They invariably sound the praises of this outstanding Elwood feature.

ELWOOD HEAD SETS

today are the choice of radio men who demand the utmost in tone clarity, sensitivity and head-fitting comfort.

2000 ohms \$5.50
3000 ohms \$6.50

Sold by dealers everywhere. If yours is unable to supply you, we will ship direct on receipt of price. You are privileged to return them if not up to your expectations.

ELWOOD ELECTRIC CO. INC.

4 Randall Ave., Bridgeport, Conn.

AERIALS NOT ALLOWED



In many places, but your Radio Receiver will work as effectively on any lamp socket if you use a

"NO AERIAL" RAD-O-PLUG

Takes the place of an aerial. Approved by the National Board of Fire Underwriters.

Price:—

\$2.50 U.S.; \$3.25 Canada

SAVE YOUR BATTERY

Charge your radio and automobile batteries regularly at home with a

SILENT NILES Battery Charger

A necessity in every radio home. Increases life of Battery. Saves expense. Rugged, efficient, silent. Operates from lamp socket for few cents per charge. Price, \$17.50; West of Rockies, \$19.50; Canada, \$24.50.

Immediate Shipments

Agents Wanted

RADIO PRODUCTS CORP.

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Representative for Western Canada
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The Need for Dependable Electrical Instruments



Filament Voltmeter



Antenna Ammeter.

WHETHER in transmitting or receiving—correct voltage or amperage information is of utmost importance to efficient and economical operation.

Control of the filament current or filament voltage makes it possible to prevent premature burnouts. Facilitates exact tuning. Duplicates results instantly. The Weston Filament Voltmeter and Filament Ammeter have been designed expressly to meet these requirements.

Accurate determinations of the plate voltage is also desirable. The Weston Plate Voltmeter is a necessity on every Transmitting Set and a convenience on all Receiving Sets.

Effective transmission depends upon the proper antenna current flow. The Weston Thermo-Ammeter is recognized as the most highly developed, scientific and dependable instrument for this purpose.

Booklet J, and other Radio Literature, describes and illustrates these various Weston instruments. Everyone interested in Radio should send for this important data. If your dealer cannot supply you with Weston instruments, we will gladly see that your needs are promptly supplied.

Weston Electrical Instrument Co.

158 Weston Ave.,

Newark, N. J.

Electrical Indicating Instrument Authorities since 1888

WESTON



"THE SUN NEVER SETS ON THE WESTON"

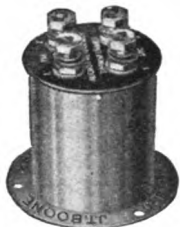
"STANDARD" The World Over

ELECTRICAL INSTRUMENTS

An Indicating Instrument for Every Individual Need and Industrial Purpose

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

A NEW STANDARD ESTABLISHED



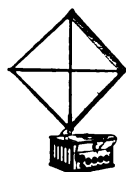
Audio Frequency
Price \$6.50

The advent of the J. T. Boone Mfg. Co.'s Radio Products has established a new Standard of Efficiency.

The "Boone" Radio Frequency Transformer is the materialization of the "DX Fiend's" dream. One or two stages added to your present set will produce almost unbelievable results in increasing your range.

The "Boone" Audio Frequency Transformer is a fit companion, producing powerful, distortionless amplification. Perfect shielding, correct impedance values of the windings, and careful manufacture account for its unusual high efficiency. If you wish to thoroly enjoy broadcast programs, be sure your Audio Transformers are "Boone."

These devices are compact and pleasing in appearance. They are carefully and rigidly tested and inspected. Instructions and proven wiring diagrams accompany each transformer.



For the man who desires a high efficiency complete set, a "Boone" Receiving Set is unquestionably "The Ultimate Solution."

Write for complete descriptive literature of our products.

J. T. BOONE MFG. CO.

3469 E. Jefferson Ave.,

Detroit, Michigan



Radio Frequency
Price \$7.50

McTighe Alkaline Storage "B" Battery FOR RADIO OUTFITS



The McTighe Storage "B" Battery is now furnished in two sizes, the original 22 volt and a new 28 volt battery, having 30% more plate capacity. McTighe Batteries are absolutely noiseless, can be charged from any light socket, and are proof against damage by short circuit, overcharging or standing unused. They are furnished in oblong glass cases which nest neatly, each with its own size.

The McTighe Chemical Rectifier will charge one, two or three "B" Batteries at one time. Our Combination Magnetic Rectifier will charge 6 volt "A" Batteries or "B" Batteries up to 120 volts.

22 Volt Battery\$5.00
28 Volt Battery 6.00
Chemical Rectifier 1.50
Magnetic Rectifier20.00

F. O. B. Irwin, Pa.

ECONOMIC APPLIANCE CO.
IRWIN, PENNA.

BIG PROFITS IN R. T. S. EQUIPMENT

R. T. S. Equipment converts the one-time buyer into a profitable, permanent customer. By handling R. T. S. Standard and Special Equipment you can fill every demand promptly, with satisfaction to your customer and profit to yourself.

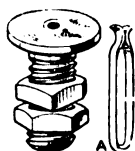
The R. T. S. Condenser, shown here, is proving unusually popular. They make the tubes perform properly, cut out "howling," and clear up phone speech. Furnished complete with mountings, ready for connection.



Made in three capacities, prices to retail trade as follows:

Grid Condenser .0005 MF30¢ each
Grid Condenser & Leak, Combined.....45¢ each
Phone Condenser .0013 MF30¢ each

R. T. S. CORD TIP JACK



This R. T. S. Cord Tip Jack leads the way in quality, service and price. Constructed of spring phosphor bronze, highly nickelled. A wiping spring contact insures a clean, positive contact at all times. Where others sell from \$1.00 to \$2.50, this R. T. S. Cord Tip Jack

Retails at.....per pair, 50¢

Jobbers and Dealers: Send Today for NEW Wholesale Catalog, with scale of prices and discounts to recognized trade.

RADIO TESTING STATION

Dept. Q-1, 25 Sturgis Street
Binghamton, New York

Save \$4
on the world's
supreme Head Set



DICTOGRAPH Radio HEAD SET

Was \$12 - Now \$8

NOW you can get the world-famous Dictograph Radio Head Set at a clear saving of \$4.00! The tremendous demand, calling for quantity production, makes possible the new price of only \$8.00. Never before has a radio Head Set of like quality been offered for so little money. This is exactly the same Dictograph Radio Head Set that has always sold for \$12.00—made by the makers of world standard Dictograph products, including the marvelous "Acousticon" for the Deaf, the

Detective Dictograph, the Dictograph System of Loud Speaking Telephones.

Take advantage of this saving now. Note the amazing improvement effected in your receiving set by the Dictograph principle of super-sensitive and accurate sound reception. 3000 ohms, for all crystal detector or vacuum tube receiving sets. Regularly furnished as Standard Equipment with leading radio receiving sets.

Note: Plans are now under way for the production of the new Dictograph SUPER-TONE Head Set, the most perfect instrument that can be made. Price, \$12.00.

The Standard of the World

DICTOGRAPH Radio LOUD SPEAKER

The perfect Loud Speaker for the home. A handsome instrument of superb quality and priced at only \$20, complete with 5 ft. flexible cord. Reproduces every sound in absolutely clear, natural tones, free from noise or distortion. Ask for a free demonstration at reliable radio shops.

\$20

complete with 5 ft. flexible silk cord. An overwhelming value at this low price.



DICTOGRAPH PRODUCTS CORPORATION

220 West 42nd Street

(Branches in all principal cities)

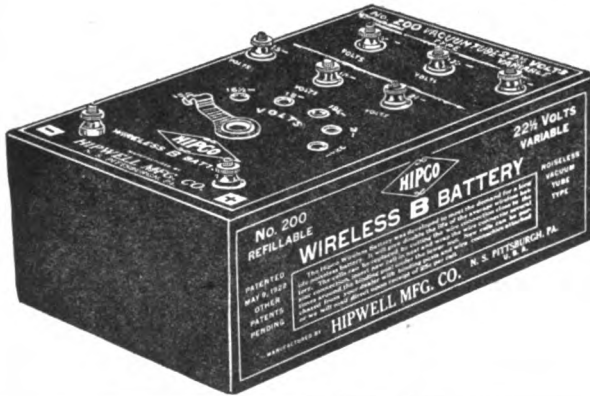
New York City



PRICE \$3.50

THE NEW IMPROVED WIRELESS B BATTERY REFILLABLE VARIABLE NOISELESS IN OPERATION

The Switch Makes It 100 p.c. Perfect



Must be seen to be appreciated. It has all the features that made last year's B Battery the phenomenal success. Ask for catalogue describing our full line of B Batteries and other Radio Supplies.

For sale at all radio supply dealers.

HIPWELL MFG. CO
N. S. PITTSBURGH, PA.

The first man to listen over a telephone

didn't hear very much. Today he listens with comfort and complete understanding. The difference is due to better apparatus.

The AMERTRAN



super audio frequency
amplifying transformer

gives 88.6 times audibility in your receiving, *without distortion*. Two stages (2 AMERTRANS) give 1490 times audibility. It is doubtful if the substitution of any one thing in a radio set could make such a notable improvement as the installation of AMERTRANS.

Price \$7. Ask your Electrical Dealer, or sent carriage charges collect (Wt. 1 lb.)

American Transformer Company

Designers and builders of radio transformers for over 20 years.

176 Emmet St.,

Newark, N. J.

THIRD EDITION

JUST OFF THE PRESS



ALL UNDER ONE COVER

An Official List of all Amateurs, Special Amateurs and Broadcasting Stations of United States and Canada.

—ALSO—

A large map, size 24" x 36" printed in two colors, showing location of every Broadcasting Station in United States and Canada, and each district marked off.

—AND—

How to Construct and Operate a Honeycomb Coil Set, Detector and Two Step Amplifier.

PRICE \$1.00 COMPLETE

(Do Not Send Stamps)

Order from your dealer—If your dealer hasn't them, send direct.

DEALERS WRITE FOR PROPOSITION!

Radio Directory & Publishing Co.

45E VESEY STREET, NEW YORK, N. Y.

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

(That's Wireless For "Attention!")

LISTEN IN, everybody. This message is for **you**. Radio promises more than ever for the coming season. Are you going to get your share of the fun, the entertainment, the culture, and the many other advantages Radio now offers?

Then it's time to think of Radio equipment. When buying Radio parts or sets ask these questions:

Who Builds It?

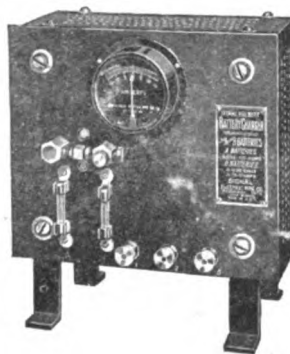
Who Uses It?



If it's SIGNAL equipment you'll find that it was produced by a plant and an organization whose experience in making small electrical goods goes back over a period of 35 years—that it grew up with "wireless"—that men there have grown gray in their service and take old-time pride in seeing that nothing but the best in materials, workmanship, and finish leaves the SIGNAL plant.

And you'll find that it is used largely for commercial purposes, by the army and navy, by the professionals in Radio, as well as by the semi-professionals and the amateurs—most successfully and most satisfactorily.

Buy SIGNAL Radio Parts or Sets and you will buy Radio Service and Radio Satisfaction.



**SIGNAL-HULBERT
BATTERY CHARGER**

Charge 2 batteries in your home at the same time for 5¢—from any 110 volt A.C. lighting socket. Send for our Booklet and Special Bulletins — use coupon below if you wish.

SIGNAL Electric Mfg. Co.

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Atlanta	Cleveland	New York	Toronto
Boston	Minneapolis	Pittsburgh	St. Louis
Chicago	Montreal	San Francisco	

You'll find our local address in your Telephone Directory

(2054)

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for guide to radio satisfaction

SIGNAL ELECTRIC MFG. CO.

1915 Broadway, Menominee, Mich.

Please send, without obligation, your interesting book about SIGNAL Parts and Sets, to the name and address written on the margin of this page.

RADIO "A" & "B" STORAGE BATTERIES CHARGED AT HOME

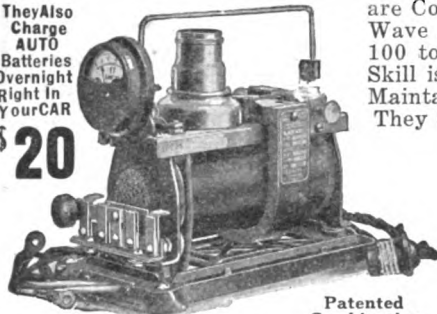
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Volt 60 Cycle LAMP SOCKET, WITH AN

It Charges All 6 Volt RADIO "A" & AUTO Batteries; & RADIO "B" Storage Batteries Up to 120 Volts, In Series, Inductively. Disconnecting Unnecessary. Nothing To Slop Over, Burn Out, or Cause Trouble. It Charges Automatically, Operating Unattended. IT WILL CHARGE A DEAD BATTERY. Leave Battery Wherever it is, Without Even Disconnecting it; Screw Plug in Lamp Socket, Snap Clips on Battery Terminals; Turn Switch & Battery will be charged in the morning. Is it not gratifying to feel that Your Radio Batteries will never fail & You are always Ready to Receive RADIOPHONE Broadcast Music, Sermons & News; never having to be careful of or to tell Friends Your Batteries are dead? F-F BATTERY BOOSTERS

They Also Charge AUTO Batteries Overnight Right In Your CAR

\$20



Patented Combination.

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Type 6 for 6 Volt "A" Battery, Charging at 6 Amperes \$15

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Type 1612 Charges 12 volt Battery at 7 amperes \$20

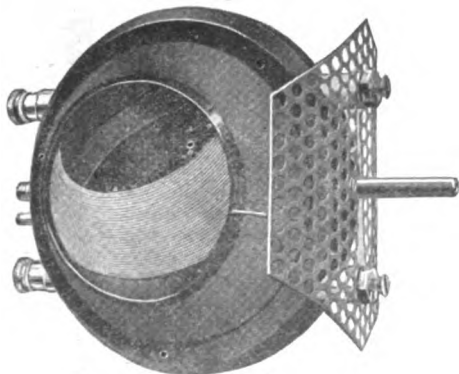
Type 1626 is a Combination of Both Type 166 & 1612 \$28

Eventually You Will Buy An F-F RECTIFIER. Why Not Now? The Sooner You Buy it: THE MORE YOU SAVE. All Types But "B" charge Auto Batteries. The Larger TYPES are for heavy Batteries, or Where Time is limited. Shipping Weights Complete with AMMETER & BATTERY CLIPS 11 to 15 lbs. Purchase from Dealer, or Mail Check for Prompt Shipment. If via Parcel Post add Postage & Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge Batteries from Farm Lighting Plants & D.C. Circuits & For GROUP CHARGING use our 12 Battery 8 Ampere Full Wave Automatic ROTARY Rectifier described in FREE Bulletin No. 31A. ORDER Now or WRITE Immediately for FREE BOOSTER BULLETIN No. 31.

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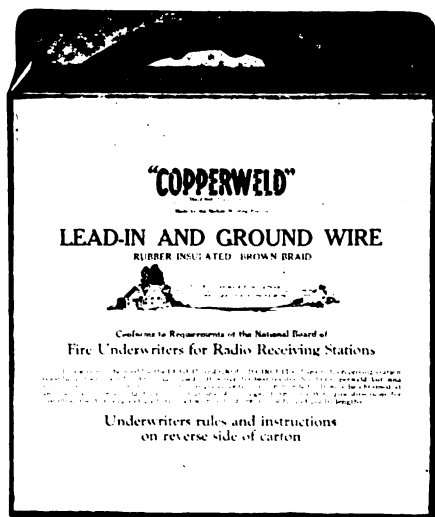
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nation—to say nothing of the DeForest Everyman and Radiohome sets—and you get an idea of the way DeForest is serving the nation with the joys of radio.

DeForest manufactures receiving sets all the way from the least expensive to the most elaborate, and laboratory tested high quality parts for those who "build their own." If it's DeForest, it's built in a way worthy to sustain the reputation of that great name.

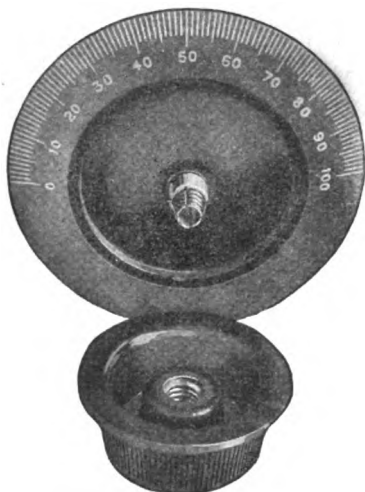
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Patented June 20, 1922

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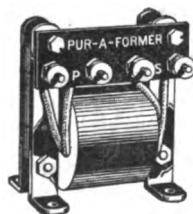
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"Modern Radio Operation,"\$1.75

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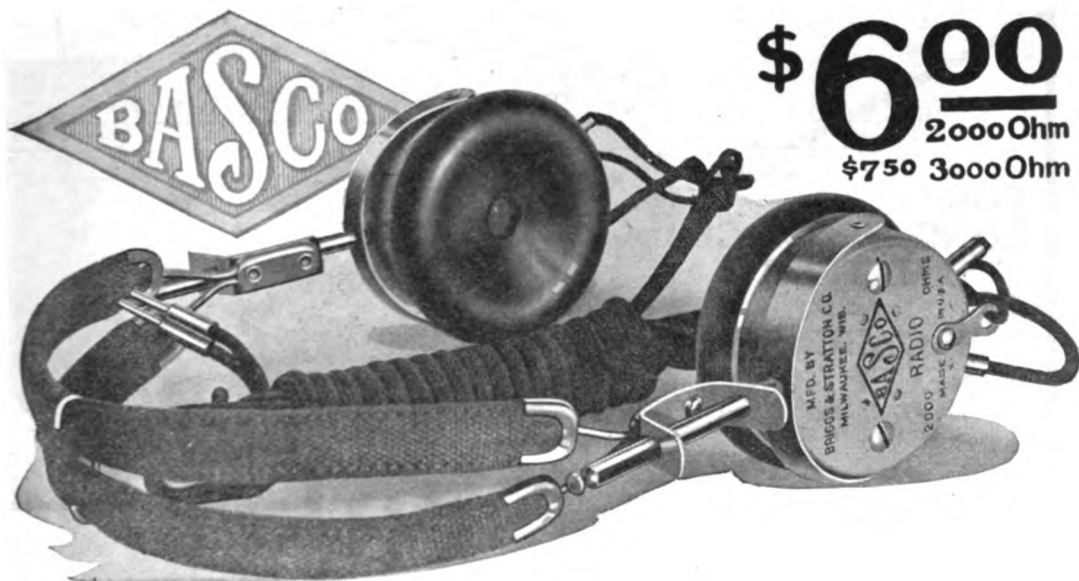
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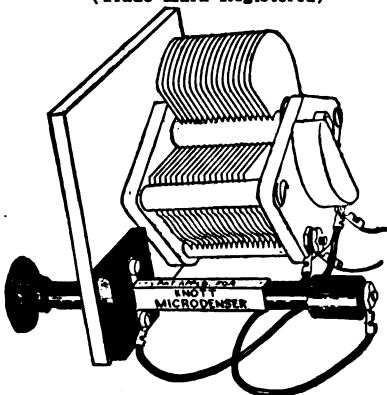
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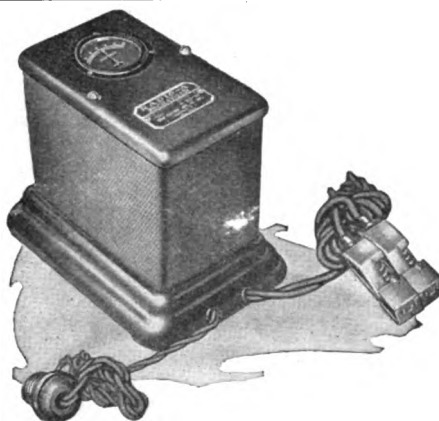
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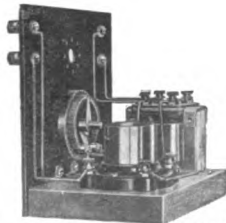
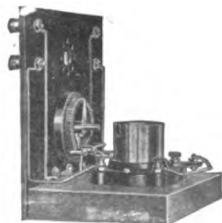
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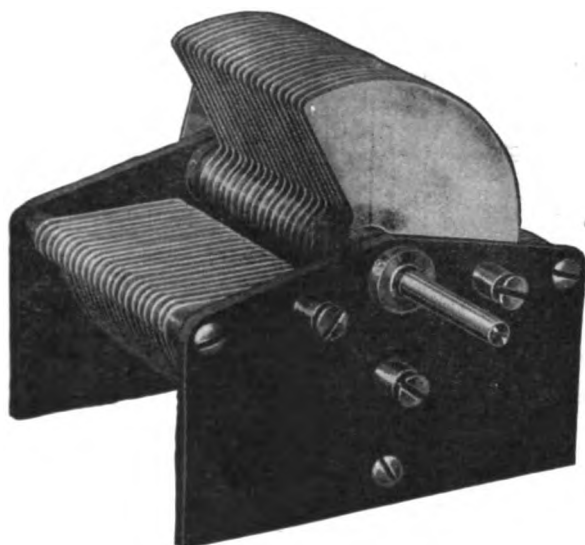
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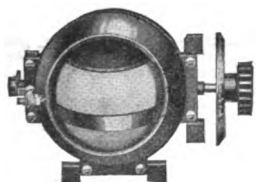
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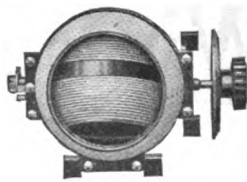
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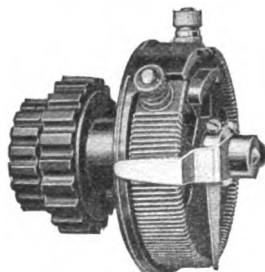


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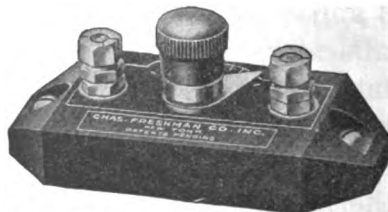
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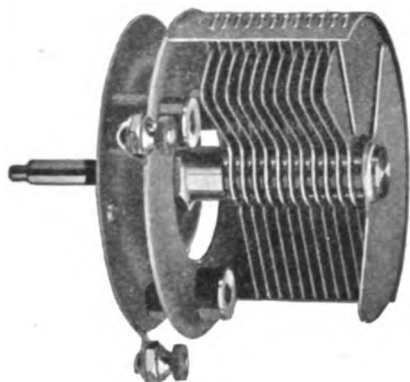
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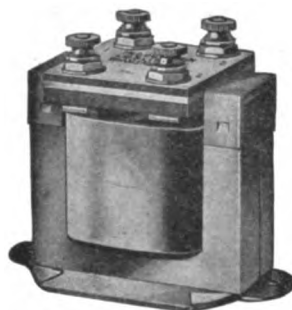
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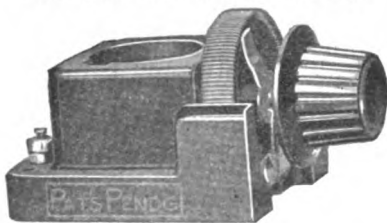
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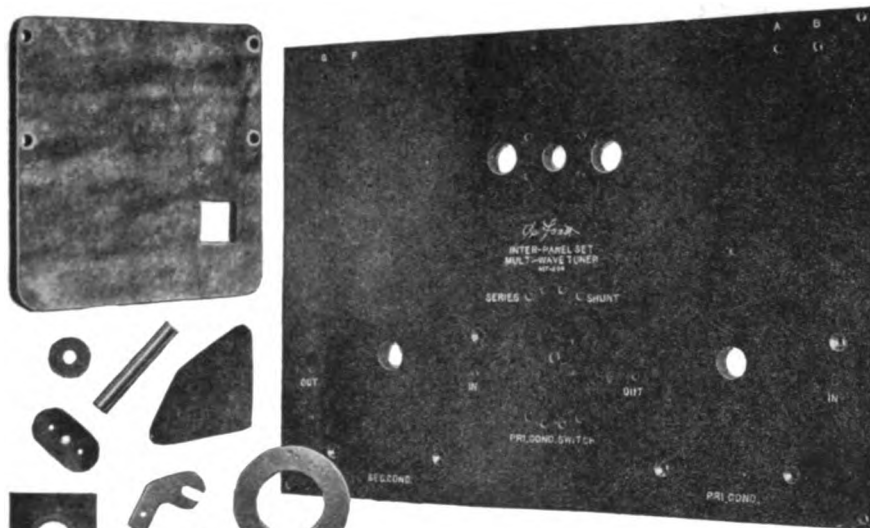
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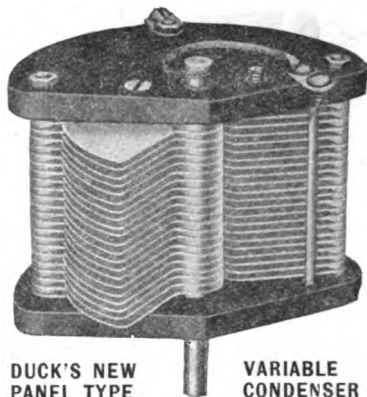
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Rheostat, 70¢; Bakelite moulded positive contact, 70¢; Bakelite moulded dial, 55¢; super-selective moulded variometer, \$4.65, worth \$8.00; radio frequency potentiometer, \$1.15; solid mahogany form variometer, \$3.60; 43-plate panel-type variable condenser, pigtail connection, \$3.15; detector panel, \$5.25; receiving set, mahogany cabinet, detector and two stages of audio frequency, \$59.50; radio frequency receiving set with one-step radio and detector, \$29.75.

SEND 25c. in coin or money order for our big 256-page combined radio catalog and text book. For radio information and hook-ups it is worth many times the retainer asked.



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VARIABLE CONDENSER

acclaimed by all that have seen it to be the peer of any on the market. Pigtail connections, i. e., no sliding contacts. Base and top moulded bakelite. Aluminum separators, i. e., even spacing and simple means of adjusting plates. Mounting screws furnished. Concealed by dial. Brass bearings; 1/4" shaft.

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—IT REPLACES
rheostats
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AMPERITE

Automatic Filament
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**RELIEVES YOU OF ALL
TUBE TROUBLES**



\$1.10 with mounting

Manufacturers

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99 WARREN STREET
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3000 OHM SETS, \$3.98

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We mail phones the day your order arrives. Every pair tested, matched and guaranteed as sensitive as \$8 to \$10 Sets. Circular Free.

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Type 104-A —**

**A suitable comple-
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**CARDWELL RADIO FREQUENCY TRANSFORMERS are the
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Trade Mark

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Master Code in Minutes instead of Weeks—Qualify in Hours instead of Months—Succeed after failing with other methods.

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For one Dime will mail Code Memorizing Records of Beginners in 12 Radio Districts who **QUICKLY** made themselves Licensed Operators and reported experience to enlighten you.

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**WATERPROOF—WEATHERPROOF—BREAKPROOF AND FOOLPROOF
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A New COLE Product

THE transformer itself is entirely surrounded with electrical wax inside a hard aluminum case. Moisture, temperature changes, hard knocks, abuse cannot in the least affect the efficiency of the Cole Transformer. No single resonant point. Equal amplification at all audio frequencies from 200 to 2000 cycles. The best transformer for WD11 Tube. None better for UV 201. Static and other noises eliminated by grounding case. Write for illustrated circular.

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**MULTIPOINT
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**A synthetic CRYSTAL DETECTOR
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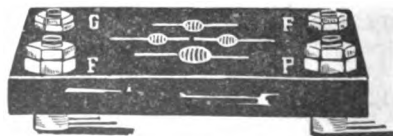
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Sensitiveness guaranteed **50c**

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For W-D-11—DRY CELL TUBE

Holds tube firmly.
Makes Perfect Contact

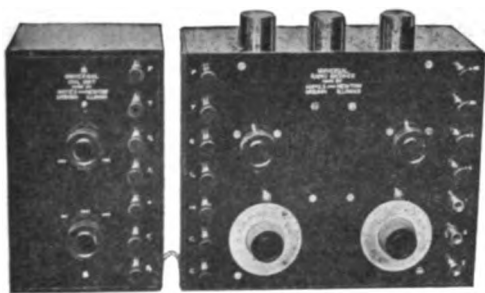
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We also make an Adapter that fits Standard Sockets, Price \$1.00.—Dealers Write for Discounts.

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The Biggest Advance Yet Made Toward Elimination of Distorted Signals is Found in the Universal Ra- dio Receiver and Coil Unit

This set has been designed to cover all the fine points of radio technique.

The wave length range possible with Coil Unit is 180 to 6200 meters. Wave lengths ranging from 200 to 2500 meters may be covered when using the standard coupled circuit.

The proposed changes in broadcasting wave lengths by the government require a larger wave length range than in use today which means that the average radio receiver must be altered to receive all broadcasting waves. The proposals cover ranges from 200 to 2500 meters.

The terminals of various circuits are brought out to binding posts which allows the operator to use any of the following standard hook-ups; single circuit, two circuit, regenerative, or oscillating.

FINE TUNING OF THE SET is accomplished by means of the **VARIABLE CONDENSERS**.

Weak and strong signals may be received alike **WITHOUT DISTORTION**.

This set is very compact, flexible in adaptation of various circuits to any desired hook-up. It is easy to operate because of the convenient location of the various adjustments and, at the same time, the set has a very high efficiency. This set has been thoroughly tested and the results are highly satisfactory.

Cabinets are finished mahogany and the panels are of bakelite.

Size of Universal Coil Unit, 5 1/4" x 9 1/4" x 4 1/4"

Size of Universal Radio Receiver, 11 1/2" x 9 1/4" x 4 1/4"

We guarantee the workmanship and quality of this set to be of the highest type.

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No Storage Battery Required
Amplifying unit uses a West-
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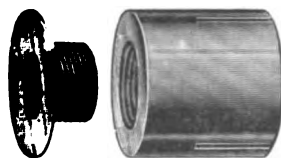
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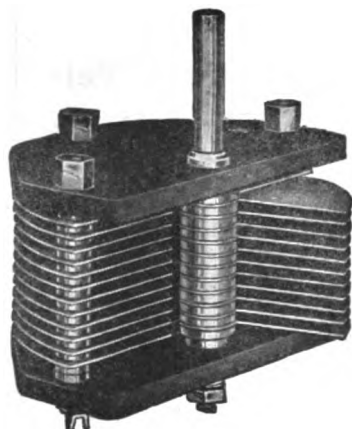


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IF YOU USE AMPLIFYING TUBES
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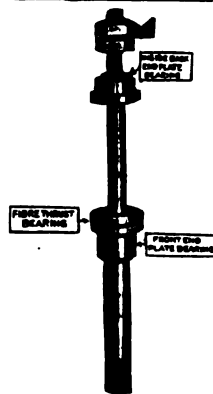
MAXEFF Condensers are admirably adapted to CW reception with the Reinartz tuner. The smoothness of operation provides unusually even variation of capacity—absolutely essential in the Reinartz tuner. 11 and 23 plate sizes are correct.

ELECTRICAL CHARACTERISTICS

Large insulating end plates cut from sheet insulating material which provides minimum dielectric losses. Perfect electrical contact.

MECHANICAL FEATURES

Carefully fitted metal bearings on both ends of shaft. Adjustable Rotor Shaft Bearing.



PRICES

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11 Plate .00025 mfd.	3.15
23 Plate .0005 mfd.	3.50
43 Plate .001 mfd.	4.50

Shaft and Bearings used in MAXEFF Condensers

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This is the cry of the busy Radio salesman during rush hours.

The EBY SILENT SALESMAN (illustrated below) will assist the man behind the counter as it enables the customer to wait on himself—and quickly.



Price to Jobbers
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The tone is produced by *original Baldwin Type C. Unit* and reflected into the outer horn. There is no metallic effect. Finished in black and gold to harmonize with any surroundings.

Correctly designed—fairly priced—unreservedly guaranteed. The **ORIGINAL \$20.00** loud speaker and still the **BEST**. With original **Baldwin Type C. Unit**. Price complete **\$20**

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Quality Radio Exclusively

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FOR SINGLE—THREE
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A high grade unit priced right & unconditionally guaranteed. Formica tubes—Green silk wire. Nickel plated brass fittings. Good design—Perfect workmanship. Bulletin C describes in detail.

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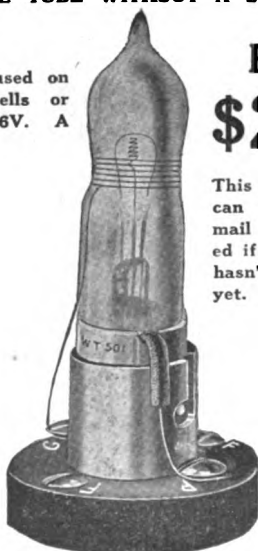
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WELSH PEANUT TUBE

W. T. 501
THE TUBE WITHOUT A SQUEAL

Can be used on
3 dry cells or
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Price
\$2.00

This sturdy Tube
can be sent by
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Sold only for experimental use as a detector.
Samples list price: Jobbers and dealers write
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Nickel plated socket-moulded base—double
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AMATEURS tell your friends who want to learn
the code, about this method. One Amateur writes
"I tried it on a friend who has learned it at
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ONLY NEW ENGLAND DISTRIBUTOR OF
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**ONLY DISTRIBUTOR OF
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3 PLATE VERNIER.....	\$1.75		
11 PLATE .00025.....	3.25	With Vernier....	5.00
13 PLATE .00027.....	3.50	" "	5.00
17 PLATE .0004.....	3.75	" "	5.50
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Also Distributor of the
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Stromberg-Carlson Radio Headset

This Standard Headset has unexcelled tonal qualities. Reproduces accurately faint long distance signals; fits comfortably and is quickly adjustable to any size head. The forked cord permits separation of the receivers for use by two observers simultaneously.

Other Stromberg-Carlson Specialties include the "Universal Radio Plug" and various styles of "Radio Jacks"—made to fit all standard equipment.

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The RT-1 Frequency Transformer covering a range of 175 to 500 meters, built by the Radio Service Laboratories, has long been recognized as the best transformer of its kind on the market. It is with pardonable pride that we announce two new types of radio-frequency transformers that are far ahead of anything on the market today. Realizing that it is impossible to obtain maximum efficiency for both the amateur, who builds his own set and is only interested in C.W. work; and for the man who purchases his set and is only interested in the broadcast reports and entertainments, we have perfected a transformer for each class. We have more than doubled the amplification by cutting the range in half.

AS A RESULT WE NOW OFFER

TYPE RT-5 a transformer of high radio frequency amplification specially selected for the first stage for the amateur range only, 150 to 300 meters. RT-5A is a transformer that is interchangeable for the second and third stages.

TYPE RT-6 a special transformer of equally high radio frequency amplification for the first stage, for the broadcast range only. 300 to 600 meters. RT-6A is a transformer that is interchangeable for the second and third stages.

These new types are put through the famous triple test and are still the only completely shielded iron core radio frequency transformers on the market. These new types have literally taken the "Freak" out of Radio Frequency and give

"Louder Signals with less noise
Greater Range with same equipment."

RADIO SERVICE LABORATORIES Transformers by actual test are superior to any domestic or foreign make in the market. For sale at reliable electrical shops or stores where Radio supplies are sold. All types retail at \$6 each.

Send ten cents for copy of booklet on Radio Frequency with schematic diagrams. A most valuable and helpful publication for the radio amateur and expert.

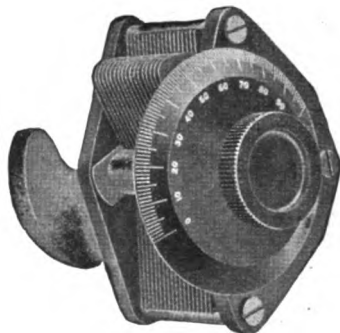
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CHELSEA CONDENSERS



No. 3

PRICES

No. 1	Table .001 mf.	\$5.00
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No. 3a	Panel .001 mf. without dial	4.35
No. 4	Panel .0005 mf. with dial	4.25
No. 4a	Panel .0005 mf. without dial	3.85
No. 5	Panel .00025 mf. with dial	3.75
No. 5a	Panel .00025 mf. without dial	3.35
No. 6	Panel vernier with dial	2.90
No. 6a	Panel vernier without dial	2.50
No. 7	Table .001 mf. with vernier	6.75
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Genuine Bakelite Construction
The best and most complete line
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World Radio Batteries SAVE YOU 50%

WRITTEN 2 YR. GUARANTEE

Direct factory to user sales methods save you 50%. Highest quality material insures you 100% service. Every battery backed by our written two-year guarantee. You take no risk. Batteries shipped express C. O. D. for your inspection. Mail your order today - at once.

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RADIO PRICES:

6 Volt. 40 Amps. \$ 8.50

6 Volt. 60 Amps. 10.00

6 Volt. 80 Amps. 12.50

6 Volt. 100 Amps. 14.50

No other manufacturer offers such a high quality battery at such a low price. Save 50 per cent on your next battery and get better and longer service - buy a World Storage Radio Battery. Write today.

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!! SAVE THIS LIST—IT WILL NOT APPEAR AGAIN BANKRUPT STOCK MUST BE SOLD !!

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Quan.		Price	Price	Quan.		Price	Price
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UV 216 Kenotron	10	7.50	3.75	252 Pacent Multijack	41	1.50	.75
UP 1016 Power Transf'r	1	38.50	18.50	261 Pacent Jack	133	.70	.35
UP 1627 Filter Reactor	1	15.75	7.75	262 Pacent Jack	45	.85	.40
UP 1719 Grid Leak	4	1.10	.65	263 Pacent Jack	81	1.00	.50
UP 1718 Grid Leak	7	1.65	.85	265 Pacent Jack	50	1.00	.50
UT 1643 Magnetic Mod.	2	9.50	5.00	266 Pacent Jack	80	1.20	.60
UT 1357 Magnetic Mod.	1	12.00	6.50	Ohio 43 plate Cond. .001	19	4.50	1.75
UT 1367 Magnetic Mod.	2	17.00	8.00	Horne 43 plate Cond. .001	21	3.95	1.50
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UP 415 Plate Reactor	1	5.75	3.25	Gen. Radio 35p Cond. .001	4	4.25	1.95
UC 1014 Faradon Condenser	2	2.50	1.50	Dubilier Fixed Cond. .001	40	.75	.35
UC 1015 Faradon Condenser	4	5.75	3.00	Dubilier Fixed Cond. .002	10	.75	.35
UC 1803 Faradon Condenser	4	5.00	2.75	Univ. Grid Cond. .00025	85	.20	.06
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Pocket Ammeter O-60 amp.	11	2.00	1.00	Switch	10	4.50	2.25
Polarity Indicator	9	1.50	.75	100 amp. Ground Switch	24	3.60	1.60
HPMCO Crystal Detectors	6	1.50	.60	Switch levers (sp. & bushed)	283	.50	.15
BD Crystal Detectors	5	1.50	.60	Switch levers (spring only)	75	.25	.05
Westinghouse Crystal Detectors	5	6.50	2.50	Switch points 1/4" head	300	.04	.01
Nutmeg Buzzer	10	.75	.40	Switch lever stops	876	.03	.01
Solderall	28	.30	.16	Switch—1 point—wood base	8	.20	.10
Test Clip—Large	40	.20	.10	Amperite—Fil. Cur. Adj'r	7	.70	.25
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QRA 1ANA R. B. Bourne, Radio Corporation of America, Chatham, Mass.

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WOULD YOU REFUSE opportunity like this??? Here is unusual chance to buy Complete Synch. Transmitter for \$185.00. Only few months ago, our price was \$500.00 for the very same Sets. The reason?... This is the last one. Picture and description on request. Chicago Wireless Equip. Co. 2312 Greenview Ave., Chicago.

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THE CALL 1FD has recently been assigned to my station. Will appreciate card from anyone hearing same. James L. Hubbard, Norwich, Conn.

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SAVE YOUR OLD "B" batteries. We have a charger that will make your old dry "B" battery like new again, only \$2.00. Varico-couplers, \$3.75; Amplifying Transformers, \$4.00. Complete radio sets, \$6.00. R. E. D. Electrical Co., 191 East Naghten Street, Columbus, Ohio.

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FOR SALE, 1KW Thordarson transformer type R. New \$30.00; 1 Thordarson OT \$8.00; Kick back \$3.00. Leon Randall, Water Street, Keene, N. H.

SALE: 1/4 KW Transmitter complete with cabinet, \$75.00. Eighteen panel DeForest receiving set with added accessories, \$125.00. Wm. H. Randel, 14908 Euclid Ave., Cleveland, Ohio.

WE NEVER WON A beauty prize but 4GL Radio Frequency Transformers sure do the work. \$3.15 each, postpaid, from factory to you. Range 200-600 meters. Circuit with each transformer. Savannah Radio Shop, 1223 East Duffy Street, Savannah, Georgia.

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SALE: Grebe receivers, Magnavoxes, vacuum tubes, batteries, chargers, Federal filter coils, grid leaks, variometers, couplers, head phones, condensers, vacuum tube control units. For quick sale 10% discount. Sent upon receipt of N. Y. draft, money order or C. O. D. H. C. Stearn, 160 Salem Ave., Carbondale, Penna.

CLEARANCE SALE. Unusual bargains in new and used apparatus to make room for new stock. Bulletin S-3 for two cent stamp. The Radio Exchange, Hamilton, Ind.

GREBE CR-3 like new 150 to 680 meters, \$50.00. Elmer Scheer, 4452 Farlin, St. Louis, Mo.

20 WATT FONE & C.W. TRANSMITTER. Set at 1ASF complete with bakelite panel and four meters. Brass stand for power transformer, rectifier, etc. \$175.00 with tubes. For particulars, write Albert F. Sise, 31 Powder House Road, Medford, Mass.

1 W. E. V. T. 1 \$6.00; 2 Jewell thermocouple radio frequency ammeters 0-5 and 0-2 \$10.00 apiece; 1 Signal Electric Co. Detector and two step \$35.00 cost \$45.00; 1 Westinghouse Rectigon 1-6 Amps. with control rheostat and ammeter \$25.00. Above articles hardly used. Absolutely guaranteed. Ed. Searing, 499 Scott Street, Milwaukee, Wis.

EDISON "B" BATTERY UNITS one positive and one negative plate for 10¢. 15 sets will make a 24 volt battery. Wilkinsburg Wireless shop, 711 Penn. Ave., Wilkinsburg, Pa.

ITS NOT VOLUME you want but DX and clarity. 4GL Radio Frequency Transformers do the trick. Made right; priced right. Savannah Radio Shop, 1223 East Duffy Street, Savannah, Ga.

BARGAIN: Reinartz tuner \$25, Vibroplex \$12, Detector and two step \$60, 3 5-Wattors like new \$20, 5 ampere Tungar bulbs and socket new \$7, Single circuit tuner \$25, Honeycomb tuner \$5, Special Thor. 800 Watt 3000 Volt C.W. plate transformer \$30, Three new Eveready "B" batteries \$4, Three 7000 Volt .002 mfd. C.W. fixed condenser \$2.50 each. E. D. Smith, 219 Rittenhouse St., N. W., Washington, D. C.

9CNS is located at Rushville, Nebraska—Mr. T. C. Shipley—100 watts DCCW—pse QSL all answd. Tnx

RADIO STATIONERY—Cards printed to order, 250 \$2.00; 500, \$3.50; red call, black printing; color change 25c extra; Gov. postals 1c extra each card. Letterheads 8 1/4 x 5 1/4, 200, \$1.75; 500, \$3.25. Other printing in proportion. Write for prices. Rolland F. Sultze, Mendota, Ill.

FOR SALE 1/4 KW Thor. Amrad Quenched Gap, Murdock O. T. glass plate condenser, kick back preventer, 20 dollars. Honey combs and one step with 15 coils, handsome cabinet in fine condition. 75 dollars. Telephone 4361 Montclair. H. Smith, 191 Alexander Ave., Upper Montclair, N. J.

WANTED: Volume one of QST, must be in good condition. M. Stork, Box 155, Belleville, Ontario.

8BQ's DX. Spark transmitter cheap. Other equipment. All like new. H. Walleze, Danville, Penna.

SALE OR EXCHANGE—Two good regenerative receiving sets with two stage amplifiers at \$60 and \$70 or \$125 for both. E. T. Ballon, Ware, Mass

FOR SALE At most any price because thrown on my hands through foreclosure of mortgage. Three \$350.00 and six \$325.00 Hatfield receiving sets complete in every detail with Magnavox, etc., address Dr. Wesley C. Warner, 414 Shoaff Building, Ft. Wayne, Ind.

FOR SALE: Movette motion picture Camera, tripod and projector and 50 feet of unexposed film or will exchange for radio apparatus. Value \$50.00. Address Dr. H. E. Watkins, 28 Pleasant St., Worcester, Mass.

BARGAINS—Tungar Rectifier, \$15; Westinghouse tubes, \$6.50; Dictograph \$16; Horne variometers and variocouplers; \$2.95; Assembled Honeycomb coil regenerative set with two stage amplifier, handsome cabinet with jacks \$30.00; Peanut tube set \$10; Soldering kits \$1.50; Grid leaks, condensers, etc. 25% off; Thordarson 25000 volt transformer with gap and Murdock OT; \$21.50 (Used). J. M. Williams, Hamilton, Texas.

SELL CHEAP or Trade for CW stuff; Ranger Bicycle and Snare Drum. James Wilson, Gary Ave., Wheaton, Illinois.

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C.W. POWER Transformers 200 Watts, 500 Volt secondary, 350 Volt tap, \$6.50; 1000 Volt secondary, 500 Volt tap, \$12.00; 43 plate condensers, \$3.00. All post paid. Money back guarantee. M. Zumppe, 824 North Sixth St., Lafayette, Ind.

FOR SALE complete regenerative and 2 step amplifier verniers ant. condenser \$100.00. Brewster Woodburn, Hampton, Ia.

MUST SELL. Unused receiving set with two stage amplifier in beautiful cabinet with hinged lid, removable back. B batteries in cabinet. Exceptionally good on broadcast reception. Complete with tubes, batteries, Baldwin loudspeaker, and aerial. No extras to buy. Price \$100.00. Will include new Magnavox instead Baldwin loudspeaker for \$25.00 additional. Photo ten cents. D. Aldrich, Hamilton, Ind.

COMPLETE Navy 500 cycle spark sets. Brand new Western Electric Sub-Chaser outfit complete with all spares. 3 KW Coffin \$20.00. Henry Kienzle, 501 E. 84th St., New York.

FOR SALE: Two $\frac{1}{4}$ KW Thors, \$7.50 each; five Murdock condensers, \$1.75 each; Benwood 12 stud Super gap, \$15.00; Eldridge H. W. Ammeter 0-5, \$5.00. Ellwood Hoepfner, Palmyra, N. J.

FOR SALE: One new pair Western Electric Phones, never used. \$6.50. W. B. Adair, 2162 E. Larned St. Detroit.

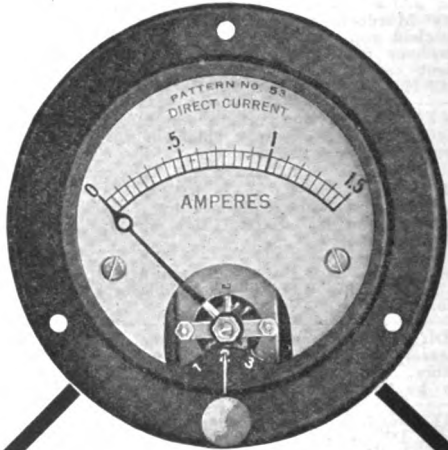
RADIOTRON Fifty Watt Power tubes. Brand new \$27.00. Northwestern Radio Co., Madison, Wisc.

FOR SALE: 4 kenotrons 216; 6 202 radiotrons; 1 A-P detector; 2 A-P amplifiers. All having filaments burnt

out. First two items due to doing work UV-50's. Walt Henrich, P. O. Box 511, Aberdeen, Wash.

QRA 75C, P. O. Box 511, Aberdeen, Wash. 100 Watts straight C.W.

BARGAIN! MUST SELL! United Wireless 1 K.W. "coffin" transformer. Variable transformer primary reactance. Large MARCONI copper-coated Leyden Jars, 12 in mahogany rack complete or single jars at \$2.90. MARCONI shipboard oscillation transformer also braided copper cable antenna tuning inductance on mahogany form. **SWITCHBOARD;** Genuine Italian white marble switchboard 2 by 3 feet on angle iron frame, stands 6 feet high, has pilot lights, 7 inch Weston 0-150 volt Voltmeter, 0-50 ampere ammeter, 4 milled Trumhull 50 ampere switches on bottom, also other switches; will sell below cost. **NEW OMNI-GRAPH** best model with 3 EXTRA sets of dials, cost \$40.00, sell all for \$19.00. Everything guaranteed to be in excellent condition. Make me an offer. John Allen Goodrich, Radio Station 9KF, 2316 Clybourn Ave., Chicago, Ill.



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FILAMENT METER**

Filament control by the use of proper instruments in receiving sets is the trend of the times. The Jewell triplex filament instrument, made as an ammeter or voltmeter, places on your panel the proper means for controlling the filaments of three tubes. It has a self contained mechanism for switching to either tube and being of small size, can be accommodated on the most compact tube set.

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Jewell Electrical Instrument Co.
1650 Walnut St., Chicago

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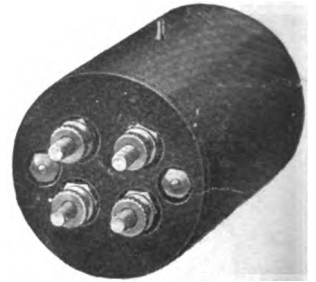
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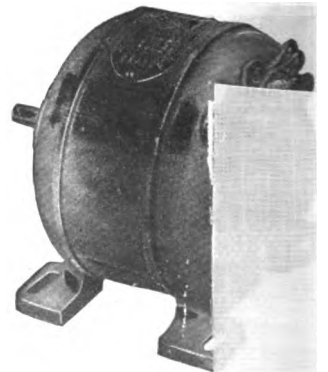
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